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ADST Software Design Document for the BDS-D VIDS-equipped M1

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13. ABSTRACT (Maximum 200 words)

This document provides detailed information describing the software design of the Vehicle Integrated Defense System (VIDS) equipped M1.

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1. Scope.

1.1. Identification.

This document describes the software design for the Vehicle Integrated Defense System (VIDS) simulation and its inclusion into the existing M1 Tank Simulator software. This software design satisfies requirements contained in the Requirements traceability tables (Section 7).

1.2. System overview.

The VIDS-equipped M1 Tank Simulator exists to support a series of survivability experiments. The nature of the experiments requires that the VIDS simulation be parameter driven. The VIDS parameters not only define available sensors and countermeasures, but also define their respective sensitivities and response times. For the present, eight sensors and nine countermeasures are simulated:

<u>Sensors</u>

a. Laser Warning Receiver (LWR).
b. Missile Warning System (MWS).
c. Future Armored System Radar (FASR).
d. Seismic Mine Sensor.
e. Non-Imaging System (NIS).
f. Tank Radar Warning Receiver (TRWR).
g. Muzzle Flash Detector (MFD).
h. Nuclear Chemical Sensor (NCS).

<u>Countermeasures</u>

a. Multi-Salvo Smoke Grenade Launcher/Rapid Obscuration System (ROS).
b. Missile Countermeasure Device (MCD).
c. Combat Protection System (CPS).
d. Laser Countermeasure Device (LCMD).
e. Vehicle Magnetic Signature Duplication (VEMASID).
f. Nuclear Biological Chemical Overpressure (NBCOP).
g. Advanced Threat Radar Jammer (ATRJ).
h. Threat Countermeasure System (TCS).
i. Chaff/Flares.

In general, the VIDS system responds to perceived threats in the following ways:

a. by displaying visual icons on the Commander's Controls Display Panel (CCDP).

b. by generating alert tones or playing alert messages which can be heard on the tank crew intercom.
c. by examining user-selected countermeasure activation modes.
d. by seizing control of the turret.
e. by activating a selected countermeasure for each perceived threat.

Because VIDS can seize control of the turret, automatic turret rotation for counterfire is supported. Furthermore, VIDS supports automatic turret slewing for visual detection of threats.

1.3. Document overview.

This document identifies and describes new software CSCs and CSUs, as well as changes to and reuse of existing M1 Simulator CSCs and CSUs. Diagrams and narratives are used to explain how the new VIDS simulation executes within the framework of the existing M1 Simulator.

2. Referenced documents.

2.1. Government documents.

SPECIFICATIONS:

1. PM-Survivability: VIDS Armored Vehicle Survivability Equipment (AVSE) BDS-D Functional Specifications, 29 May 1992.

2.2. Non-Government documents.

1. Loral: Battlefield Distributed Simulation-Development (BDS-D) Vehicle Integrated Defense System (VIDS) Feasibility Analysis Report, 14 October 1992.

2. BBN: The SIMNET Network and Protocols, Report 7627, June 1991.

3. Preliminary design.

3.1. CSCI overview.

The VIDS-equipped M1 Tank Simulator (hereafter referred to as the VIDS-equipped tank) exists as one of many entities participating within a simulated battle. Each entity communicates with other entities by sending and receiving Protocol Data Units (PDUs) on an Ethernet© network. The external interfaces for the VIDS-equipped tank are illustrated in Figure 1.

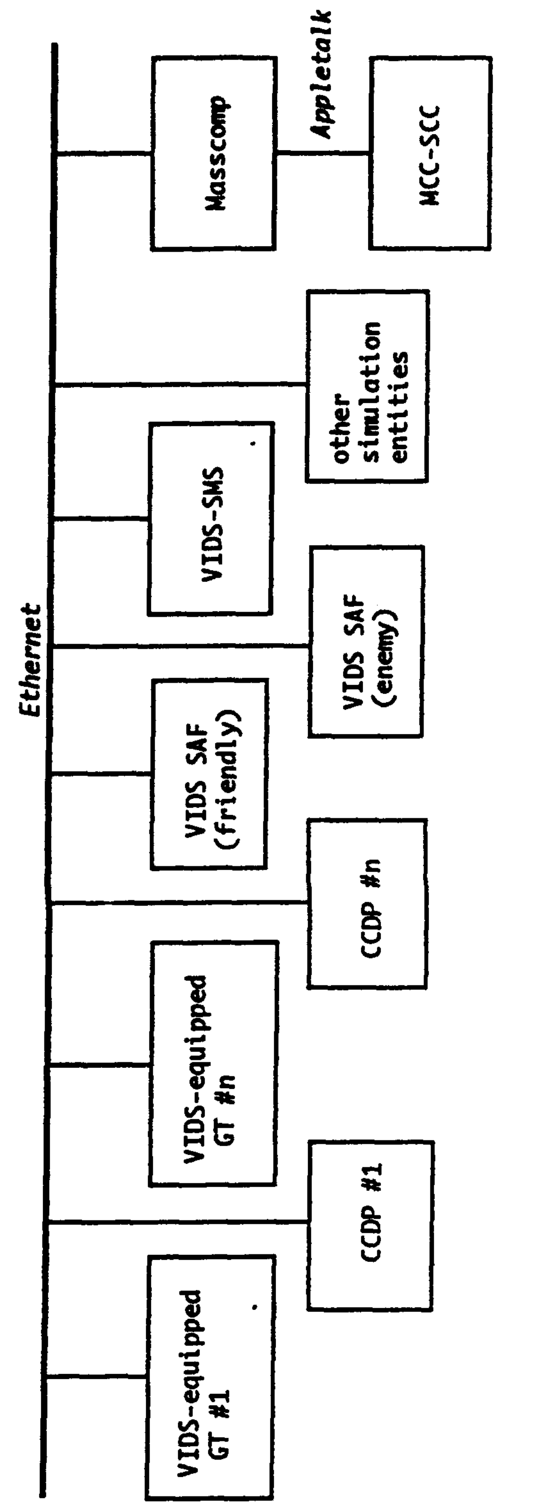

Figure 1. VIDS External Interfaces

Incoming PDUs describe the activity in one or more simulated battlefields. Because the number of incoming PDUs can be quite large, a series of high-level filters are applied to retain only those PDUs which are applicable to a specific entity. Applicable PDUs are then filtered based upon entity-specific parameters such as exercise number, distance and available sensors. Remaining PDUs are then classified and used to influence either the entity behavior or what the entity can detect.

Outgoing PDUs describe the visual appearance or behavior of the VIDS-equipped tank. Typically, these define the current tank hull position and orientation, the turret orientation, the presence of smoke clouds, chaff/flares or the existence of electro-optical energy. For experimental purposes, a subset of the outgoing PDUs contain instrumentation information which can be used by analysts to better understand VIDS behavior and the use of the soldier-machine interface.

3.1.1. CSCI architecture.

The VIDS capability is partitioned between two host computers. One host is the current M1 tank GT hardware; the other host is a PC with an Elographics touchscreen mounted in front of a 13 inch color video monitor. The software executing on the PC supports the Soldier Machine Interface (SMI), hereafter referred to the as the CCDP. This includes all the VIDS buttons, setup windows and the display windows. The software executing on the GT simulates the behavior of the sensors, countermeasures and threat resolution module (TRM).

The VIDS-PC and VIDS-GT communicate with one another just like other entities participating within a simulated battle exercise. Because there may be multiple VIDS-equipped tanks within the same exercise, the VIDS-PC and VIDS-GT are paired so only appropriate network messages are recognized and processed. In other words, the VIDS-PC knows the unique identifier (VehicleID) of its corresponding VIDS-GT, and the VIDS-GT knows the unique VehicleID of its corresponding VIDS-PC.

3.1.2. System states and modes.

The VIDS-GT CSCI operates in one of six predefined states. These states are:

a. Startup.
b. Idle.
c. Initialize.
d. Simulate.
e. Stop.
f. Exit.

Within the VIDS context, only the Startup, Initialize and Simulate states are significant.

During the Startup State, specific hardware devices are initialized and parameter files are read. It is during this state that the VIDS parameter file (VIDS.D) is read to establish the types and behaviors of available sensors and countermeasures. This file also contains a recommended list of countermeasures for each type of threat.

Once all the tank parameter files have been read, a communication link to the Simulation Network (SIMNET) is established. Having successfully completed these tasks, a transition is made to the Idle State.

During the Idle State, the M1 Tank Simulator waits to receive an activation request from SIMNET. (The activation request is generated by a user of the MCC-SCC console.) When an Activation Request PDU is received, a transition is made to the Initialize State.

During the Initialize State, additional hardware and internal software initialization is performed. For VIDS, sensor detection and identification probability tables are built; and default alert, safety, countermeasure coverage and turret scanning sector settings are sent to the VIDS-PC. Additionally, the list of available countermeasures and the inventories of the expendable countermeasures are sent to the VIDS-PC. Having successfully completed this initialization, a transition is made to the Simulate State.

The Simulate State represents the main processing loop for the VIDS-GT. PDUs sent by the VIDS-PC are read and used to alter the behavior of VIDS. Electro-optical PDUs from other entities are read and used to determine if a threat is present. When a threat is detected, PDUs are sent to the VIDS-PC to provide visual and audible cues. Furthermore, detected threats are prioritized; and countermeasures are selected and activated. The Simulate State continues until:

a. An impact PDU is received which destroys the tank.
b. A deactivation PDU is received which forces a transition to the Stop State.
b. A reconstitute PDU is received which forces a transition to the Idle State.
c. An exit command is received from the M1 Console keyboard which forces a transition to the Exit State.

During the Stop State, a transition is made to the Idle State, followed by a transition to the Exit State.

For the VIDS-PC, there are only three states: Initialize, Simulate and Shutdown. During the Initialize State, data files are read which define button positions, content and behavior. Furthermore, the VIDS-PC waits to receive the default alert, safety, countermeasure coverage and turret scanning sector settings from the VIDS-GT. Once these settings have been received, a transition is made to the Simulate State.

As with the VIDS-GT, the Simulate State represents the main processing loop for the user interface. The touchscreen is continually monitored to determine if a button has been depressed or released. Specific button actions may generate brief user alert messages to appear on the display panel. Changed button values or sector coverage widths are sent back to the VIDS-GT to influence the behavior of the sensors and countermeasures. The network buffer is continually polled to determine if PDUs sent by the VIDS-GT require updates to the display or if audible alerts must be activated or terminated.

During the Shutdown State, dynamic memory is released, special interrupt handling is suspended and control is released to the normal operating system.

3.1.3. Memory and processing time allocation.

At the present time, there are no memory budgets more restrictive than those imposed by the respective host computers. However, the VIDS-GT functions which execute during the Simulate State must execute faster than $1/15^{th}$ of a second. This is due to the fundamental execution cycle on the GT. In fact, the VIDS software execution speed must take only a relatively small percentage (20% or less) of the 66.67 milliseconds since the sum total of all simulated M1 behavior must execute within this time frame.

3.2. CSCI Design Description.

Because the simulated VIDS system is partitioned between two host computers, the description of the VIDS CSC is divided into two parts: the VIDS-GT CSC and the VIDS-PC CSC. Note that the VIDS-PC CSC is also referred to as the Soldier Machine Interface (SMI) and the Commander's Controls Display Panel (CCDP).

3.2.1. VIDS-GT CSC

The VIDS-GT CSC handles the job of simulating the behaviors of available sensors and countermeasures. Parameters sent by the VIDS-PC CSC are used to constrain the behavior of the VIDS-GT CSC. Parameters sent by the VIDS-GT CSC to the VIDS-PC CSC are used to inform the tank commander what is known about any hostile threats. Specific design features include:

a. The VIDS-GT CSC satisfies all requirements presently allocated to the GT. Refer to the table in Section 7 to locate which specific requirements are satisfied.

b. The VIDS-GT CSC is subdivided into three lower-level CSCs: VIDS_File_Read, VIDS_Init and VIDS_Simul.

c. Each of the three lower-level CSCs are executed in sequential order. VIDS_File_Read and VIDS_Init are executed only once; VIDS_Simul is executed 15 times a second as part of the M1 code which executes in the Simulate State.

3.2.1.1. VIDS_File_Read CSC

The VIDS_File_Read CSC handles the job of reading a specific text file (VIDS.D) defining the available sensors and countermeasures and the corresponding behaviors. Specific design features include:

a. This CSC satisfies the requirements for a parameter-driven set of sensor and countermeasure behaviors. Refer to the table in Section 7 to locate which specific requirements are satisfied.

b. This CSC sequentially reads a specific text file. Each line is either a comment or a keyword-value(s). Comment lines are skipped. Keywords are used to discriminate which values are being read, what format must be used, and where they must be stored.

c. The text file containing the sensor and countermeasure behaviors is read only once.

3.2.1.2. VIDS_Init CSC

The VIDS_Init CSC handles the job of preallocating dynamic memory, initializing queues, initializing countermeasure rotation CSCs and sending default parameters to the VIDS-PC. Specific design features include:

a. This CSC does not satisfy any system-level requirements.

b. This CSC handles the job of preallocating and initializing the dynamic memory to be used during the simulation of the VIDS behavior. Furthermore, it performs a critical initialization step by sending the VIDS-PC a set of default alert, safety, countermeasure coverage, turret scanning sector settings the list of available countermeasures and the inventories of the expendable countermeasures.

c. This CSC satisfies the design requirements for preallocating and initializing dynamic memory and providing default parameters to the VIDS-PC.

d. This CSC satisfies the design requirements for initializing internal tables used by the CSCs which handle countermeasure rotations.

3.2.1.3. VIDS_Simul CSC

The VIDS_Simul CSC handles the job of managing the majority of other lower-level CSCs. It is these lower-level CSCs which model the behavior of the available sensors, countermeasures and TRM. Specific design features include:

a. This CSC and its lower-level CSCs satisfy a majority of the system-level requirements allocated to the GT. Refer to the table in Section 7 to locate which specific requirements are satisfied.

b. This CSC handles the job of sequentially executing lower-level CSCs. These CSCs perform the following functions:
   1. Getting updates from the CCDP.
   2. Reacting to main and turret power state changes.
   3. Determining if there are new threats.
   4. Classifying threats based upon what is currently known.
   5. Prioritizing the current threats.
   6. Selecting countermeasures.
   7. Activating countermeasures.
   8. Sending updated threat status to the VIDS-PC.
   9. Sending countermeasure activation PDUs to other entities participating within the same simulated battle exercise.
   10. Managing the rotation of the independent slewing countermeasures.

c. This CSC satisfies the design requirement for monitoring the main tank and turret power states.

3.2.1.4. VIDS_Shutdown CSC

The VIDS_Shutdown CSC handles the job of terminating the VIDS simulation and sending the final power states to the VIDS-PC. Specific design features include:

a. This CSC does not satisfy any system-level requirements.

b. This CSC satisfies the design requirements of formally deallocating the dynamic memory used during the simulation of the VIDS behavior. Furthermore, it prints a summary of the memory usage to the main console.

3.2.2. PC-Resident VIDS CSC

The VIDS-PC CSC handles the job of simulating the CCDP. This includes a set of multi-function buttons as well as the ability to activate audible alarms and display threat information. The display screen is used to portray the type and position of threats relative to the tank. Specific design features include:

a. The VIDS-PC CSC satisfies all requirements presently allocated to the SMI. Refer to the table in Section 7 to locate which specific requirements are satisfied.

b. The VIDS-PC CSC is subdivided into 3 lower-level CSCs: SMI_Init, SMI_Simul, SMI_Shutdown.

c. Each of the three lower-level CSCs are executed in sequential order. SMI_Init and SMI_Shutdown are executed only once; SMI_Simul is executed endlessly until a keyboard Control-C or the right mouse button is depressed.

4. Detailed Design.

The detailed design is divided into two parts. The first part describes the VIDS-GT CSC and the second part describes the VIDS-PC CSC.

4.1 VIDS-GT CSC Detailed Design

4.1.1. VIDS_File_Read CSC

VIDS_File_Read reads a text file (VIDS.D) which defines the list of available sensors and countermeasures and the corresponding behaviors. This CSC is executed only once during the Startup State of the existing M1 code. Furthermore, the text file contains automatic turret rotation rates for each countermeasure, counterfire and turret scanning. The text file also contains the unique identification (VehicleID) of the PC which simulates the behavior of the corresponding CCDP.

Once all the parameters have been read, they are stored in tables. For sensors, this includes coverage angles, range limitation, detection probabilities and reaction/delay times. For countermeasures, this includes the coverage angles, reaction/delay times and in some cases (ROS and Chaff/Flares) launch distances. For the Threat Resolution Module (TRM), this includes the recommended countermeasures and priorities for each threat type.

4.1.2. VIDS_Init CSC

VIDS_Init preallocates dynamic memory structures which are used frequently during the execution of the VIDS_Simul CSC. Preallocation is done here purely for efficiency because VIDS_Init is invoked during a non-critical processing state.

VIDS_Init also sends default settings and expendable countermeasure inventories to the CCDP. This done to allow alert, safety, countermeasure coverage and turret scanning sector settings to be graphically portrayed when the CCDP is powered on.

Finally, VIDS_Init invokes functions which initialize the independently slewing countermeasure rotation tables. During this initialization, slewing countermeasure devices are aligned in the same direction as the main gun.

4.1.3. VIDS_Simul CSC

VIDS_Simul serves as the primary entry point for simulation of the sensors, TRM and countermeasures. It represents the root of a functional hierarchy which is executed once during each execution cycle of the existing, M1 simulation software. During a single execution cycle, the following high-level functions are executed:

```
Get_CCDP_Updates();
React_to_Power_State_Changes();
Identify_Threats();
Manage_Countermeasures();
Send_Updates_to_CCDP();
Send_Updates_to_Network();
Need_To_Release_Turret();
CM_Rotation_Simul();
Poison_Simul();
```

Each of these functions represent a functional sub-hierarchy which is described in the following sections.

4.1.3.1. Get_CCDP_Updates CSU

Get_CCDP_Updates retrieves the current CCDP settings. These settings are changed by user interaction with the touch screen. It is assumed that all error checking is performed by the VIDS-PC. Consequently, all individual values are assumed to be error-free and that combinations of settings are valid.

4.1.3.2. React_to_Power_State_Changes CSU

React_to_Power_State_Changes determines if the VIDS-GT system should continue to respond to sensor input and activate countermeasures. This is done by checking that both the tank Master_Power and Turret_Power are on. Only when they are both on can VIDS be on.

When VIDS is off, internal data structures used to maintain knowledge of threats and active countermeasures are discarded. Later on in Send_Updates_to_CCDP, the VIDS_Power_State is sent to the CCDP so that a similar cleanup can occur on the VIDS-PC.

4.1.3.3. Identify_Threats CSC

Identify_Threats serves as the primary entry point of sensor simulation. Only when VIDS is on is a test is made to determine if there are any new threat reports. For sensors which track threat positions and proximities (NIS and FASR), periodic queries are made to retrieve current threat reports. Each report is sent to Process_Detected_Threat() to determine if the required sensor is available. When the corresponding sensor is available, the threat report is placed into a queue for sensor-specific processing.

Since a threat can be manually deleted at any time, Manual_Threat_Update in invoked to determine if the current CCDP_Control_Settings indicate a manual threat deletion. When a deletion is indicated, the supplied threat identification is used to search and delete its record from the prioritized threat list.

Finally, each new threat report is processed by the corresponding sensor. The required sensor is sent to EO_Sensor_Simul. EO_Sensor_Simul is a generic function which is invoked to model the behavior of a specified sensor.

4.1.3.3.1. EO_Sensor_Simul CSC

EO_Sensor_Simul serves as the primary entry point for simulation of all sensors. This CSC is subdivided into three functional parts: one which simulates reaction delay, one which handles detection probability, and one which processes new threats as a function of sensor-specific coverage limits. The three functional parts are

```
Update_Delayed_Threats();
Process_New_Threats();
Test_Sensor_Coverage_Limits();
```

Each of these functions are described in the following sections.

4.1.3.3.1.1. Update_Delayed_Threats CSU

Each invocation of Update_Delayed_Threats decrements a delay counter associated with each threat in the wait queue. The counter symbolizes the remaining delay time for a given threat. The initial delay time for each threat type is assigned to each threat when it is initially detected in Test_Sensor_Coverage_Limits.

4.1.3.3.1.2. Process_New_Threats CSU

When the counter for a specific threat reaches zero, a detection probability is used by Process_New_Threats to decide if a threat satisfies the probability of detection. A detected threat is moved from the wait queue to the new threats queue. (The new threats queue will be examined later in Fuse_Correlate_Threats). A non detected threat is deleted from the wait queue.

Finally, if the detected threat is a mine, the vehicle brakes are applied immediately .

4.1.3.3.1.3. Test_Sensor_Coverage_Limits CSU

Test_Sensor_Coverage_Limits performs a series of tests to determine if a new threat report is detectable by a specific sensor. The logic of Test_Sensor_Coverage_Limits is constructed to be as generic as possible.

This means that tests for each sensor have been combined into a single set of tests which are applied equally to all threat reports. Differences between individual sensors are handled by a table of sensor behaviors where a given entry contains sensor-specific parameters. Instances where tests are inappropriate for a specific sensor are handled by providing compensating tolerances. For example, the MWS and MFD sensors require a test to determine if the threat is heading towards the tank. For these two sensors, only threats which are approaching the tank within a narrow approach angle are identified as threats. For sensors not requiring an approach angle test, the widest possible approach angle is used (± 180°) so these reports will not be discarded prematurely.

Threat reports which pass the approach angle test are further tested to determine if the threat falls within the current alert sector, and sensor azimuth and coverage sector angles. (The alert sector is one of the CCDP settings and can be changed at any time, whereas the sensor approach, azimuth and coverage sectors remain constant during the simulation.)

To simplify calculations, the threat position is mathematically transformed into the coordinate system of the tank hull. At this point, the relative threat azimuth and elevation angles are computed. If the threat is heading towards the tank and falls within the alert, sensor azimuth and sensor elevation coverage sectors, it is added to the wait queue with the sensor-specific reaction/delay time. Otherwise, the threat report is discarded.

4.1.3.4. Manage_Countermeasures CSC

Manage_Countermeasures serves as the primary entry point for countermeasure simulation. Countermeasure simulation satisfies the requirement to prioritize threats, select appropriate countermeasures and to activate individual countermeasures for each threat. These activities are accomplished by invoking the following functions:

```
Prioritize_Threats();
Select_Countermeasures();
Update_CPS_Coverage();
Individual_CM_Simul();
```

Each of these functions are described in the following sections. Note that Prioritize_Threats, Select_Countermeasures and Update_CPS_Coverage are invoked only when the VIDS power is on.

4.1.3.4.1. Prioritize_Threats CSC

Prioritize_Threats simulates the behavior of the VIDS Threat Resolution Module (TRM). Its primary purpose is to classify threats based upon the current sensor reports. Furthermore, Prioritize_Threats sorts the threats so countermeasures for the most lethal threats will be activated first. Finally, threats are automatically deleted if no new sensor reports are received within a predefined threat lifetime.

These activities are accomplished by invoking the following functions:

```
Fuse_Correlate_Threats();
Sort_Prioritized_Threats();
Update_All_Prioritized_Threats();
```

Each of these functions are described in the following sections. Note that Sort_Prioritized_Threats is invoked only when the queue of active threats has changed through an addition, update or deletion.

4.1.3.4.1.1. Fuse_Correlate_Threats CSU

The new threats queue built by Process_New_Threats is examined by Fuse_Correlate_Threats to determine if a new threat report supplies additional information for a known threat. When a new report correlates with previous reports (specifically, the SIMNET vehicle identification values match), the new sensor information is consolidated with the previous information. Sensor detection, energy type categories (some sensors like LWR can detect different types of laser energies) and threat platforms are combined into sets; azimuth, elevation and range values are replaced by the current threat report data. Only when a new report better identifies the threat are guise and vehicle type information updated.

When a new report does not correlate with a known threat, the report is added to the prioritized threat queue as a new threat. Furthermore, an alarm warning is queued. The type of alarm warning corresponds to the detecting sensor.

Get_Threat_Classification is invoked for both updated and new threats to return a threat classification. The threat classification is then used by Get_Threat_Priority to return a threat priority.

4.1.3.4.1.2. Get_Threat_Classification CSU

Get_Threat_Classification uses what is currently known about a threat to assign a classification. Threats detected by the NCS or Mine sensor have straightforward classification assignments. However, for the remaining sensors, classifications are based upon moderately complex combinations of sensor reports. Consequently, the following PDL succinctly summarizes the classification strategy:

```
if (Sensor_Reports.MINE)
  return Class_Mine;
end if
if (Sensor_Reports.NCS)
  return Class_Chemical;
end if

if (Sensor_Reports.MFD)
    Class = Class_Muzzle;
    if (Sensor_Reports.LWR && Category.LRF)
          return Class_Muzzle_w_LRF;
    end if

    if (Available_CMs.TCS)
      return Class_Muzzle_w_TCS;
    end if
end if

if (Sensor_Reports.FASR)
  if (Platform.Infantry_Support)
    Class = Class_Infantry_Support;
  else if (Platform.Tank)
    Class = Class_Tank;
  else if (Platform.Helicopter)
    Class = Class_Helicopter;
end if

if (Sensor_Reports.NIS)
  Class = Class_Helicopter;

if (Sensor_Reports.TRWR)
  if (Category.RADAR_Uplink)
      if (Platform.Helicopter)
        Class = Class_3;  /* AT-6 */
      else
        Class = Class_1;  /* AT-2C  */
      end if
      if (Platform.Unknown)
        Class = Class_6;  /* AT-2C or AT-6 */
      end if
      if (Platform.Infantry_Support)
        Class = Class_Infantry_Support;
      end if
  end if
end if

if (Sensor_Reports.MWS)
  Class = Class_9;  /* Any ATGM */

   if (!Available_Sensors.LWR & !Sensor_Reports.TRWR)
      Class = Class_7;  /* AT-4, AT-9, or AT-11 */
  end if
  if (!Sensor_Reports.LWR)
      if (!Available_Sensors.TRWR)
        Class = Class_8;  /* AT-2C, AT-4, or AT-6 */
      else if (!Sensor_Reports.TRWR)
        Class = Class_2;  /* AT-4 */
      end if
  end if
end if

if (Sensor_Reports.LWR)
  if (Category.LDES)
      Class = Class_4;  /* AT-9 */
  else if (Category.LBR)
      Class = Class_5;  /* AT-11 */
  else if (Category.LRF)
      Class = Class_10;  /* general threat */
    end if
end if

return Class;
```

4.1.3.4.1.3. Get_Threat_Priority CSU

Get_Threat_Priority is a simple function which uses the supplied threat class as index into a table of priorities. The priority for a given threat class is contained in VIDS.D. A copy of VIDS.D is included as Appendix A.

4.1.3.4.1.4. Sort_Prioritized_Threats CSU

Sort_Prioritized_Threats visits each threat in the prioritized threat queue to verify each threat is positioned correctly within the queue. Threats which have activated a countermeasure are placed lower in the queue than threats which have not. A threat which is inside the safety sector is lower in priority than one which is outside. When two threats have equal priority, the one which is closest to the main gun has higher priority. When two threats are equal in angular proximity from the main gun, the one which will be reached first with a clockwise turret rotation has higher priority.

4.1.3.4.1.5. Update_All_Prioritized_Threats CSU

Update_All_Prioritized_Threats visits each threat in the prioritized threat queue to decrement its lifetime. When the lifetime for a threat reaches zero, it is removed. Since this changes the status of the prioritized threat queue, a new prioritized threat message is sent to the CCDP so that the corresponding threat icon will be removed.

4.1.3.4.2. Select_Countermeasures CSU

Select_Countermeasures assigns countermeasures to new threats and reconfirms that the current countermeasure for an existing threat is correct. This is done by visiting each threat in the prioritized threat list and determining if it has been assigned a countermeasure. When a countermeasure has not been assigned, a table lookup is used to find the first available countermeasure. When a countermeasure has been assigned, a table lookup is still performed to confirm that the same countermeasure is still recommended. This is done because the type of threat may have changed due to sensor fusion or because an expendable countermeasure is no longer available. If the recommended countermeasure has changed, the new recommended countermeasure will be activated even if the previous countermeasure has been activated.

Once each threat has been assigned a countermeasure, a check is made to determine if there has been a manual change in the order of countermeasure activation. If the CCDP settings indicate a change, the corresponding countermeasure will be activated first in Individual_CM_Simul.

4.1.3.4.3. Update_CPS_Coverage CSU

Update_CPS_Coverage converts the CPS azimuth coverage sector from the current CCDP control settings and replaces the current CPS azimuth coverage values. The changed azimuth coverage values will be retrieved the next time CPS is activated as a countermeasure.

4.1.3.4.4. Individual_CM_Simul CSU

Individual_CM_Simul controls the activation and deactivation of countermeasures. In general, individual countermeasures are activated and deactivated simultaneously until all threats have been handled. Only when an individual countermeasure is needed to defeat multiple threats is the countermeasure activated sequentially. Furthermore, Individual_CM_Simul supports automatic modes for counterfire rotation and turret slewing.

Countermeasure activation, counterfire rotation and turret slewing can all be activated automatically or semi-automatically. (Semi-automatic activation is equivalent to automatic activation when the commanders thumb switch is engaged.) Countermeasures can be activated manually using buttons on the CCDP, but manual counterfire rotation and turret slewing is still controlled by either the tank commander oı gunner controls. Note, however, that all countermeasure activations require arming. A button on the CCDP arms all countermeasures.

Manual countermeasure activation occurs when countermeasures are armed and a countermeasure button is depressed (back lighted) on the CCDP. Electro-optical countermeasure energy is transmitted endlessly until either the corresponding button is released or countermeasures are made safe (disarmed). Manual ROS activation launches a salvo of grenades within the CM Coverage sector. Manual chaff or flares activation launches all expendables at once. Furthermore, manual jamming or a salvo of smoke grenades, chaff or flares can occur concurrently with any mode of turret slewing.

Automatic countermeasure activation occurs when all of the following conditions exist:

a. the CM mode is automatic or semi-automatic.
b. the recommended countermeasure for a threat is available.
c. countermeasures are armed.
d. the commanders thumb switch is engaged (necessary only for semi-automatic activation).

Furthermore, if a countermeasure requires turret rotation prior to activation, automatic modes for both counterfire rotation or turret slewing are temporarily suspended.

Automatic rotation for counterfire will occur when the following conditions exist:

a. the CFIRE mode is automatic or semi-automatic.
b. automatic countermeasure activation has not seized control of the turret.
c. the commanders thumb switch is engaged (necessary only for semi-automatic activation).

Automatic turret rotation temporarily suspends automatic turret slewing.

Automatic turret slewing will occur when the following conditions exist:

a. the SCAN mode is automatic or semi-automatic.
b. automatic countermeasure or counterfire rotation has not seized control of the turret.
c. the commanders thumb switch is engaged (necessary only for semi-automatic activation).

The following countermeasures are simulated: ROS, MCD, CPS, ATRJ, LCMD, VEMASID, TCS, NBCOP, Chaff/Flares. Furthermore, the radar search energy of the FASR sensor and the forward-looking infrared (FLIR) energy of the MINE sensor are simulated here. However, to simplify their design, countermeasures have been simulated by generic CSUs. Those countermeasures which have similar operating characteristics have been grouped together. The modules and the countermeasures they simulate follow:

a. ROS_Simul: ROS.
b. EO_CM_Simul: MCD, CPS, ATRJ, LCMD, VEMASID, the radar search energy of the FASR sensor, and the FLIR energy of the MINE sensor.
c. TCS_Simul: TCS.
d. Decon_CM_Simul: NBCOP.
e. One_Shot_CM_Simul: Chaff and Flares.

Each of these modules are described in the following sections.

4.1.3.4.4.1. ROS_Simul CSU

ROS_Simul serves as the primary entry point for simulation of the Rapid Obscuration System (ROS). This system launches smoke grenades to temporarily hide the tank position from electro-optically guided or terminal homing missile threats.

For simulation, the turret is conceptually divided into 24 equal sectors each with 15 degrees of coverage. Each sector may contain zero or more grenades; and there may be more than one smoke grenade type for individual sectors.

For manual activation, the number and sectors are specified by the CCDP countermeasure coverage sector. Smoke grenades are launched a predefined distance from the tank hull.

For automatic activation, launch sectors are selected dynamically. Launch sectors are selected which require the minimum turret rotations to get the recommended smoke grenades between the threat and the tank hull. Once the turret has rotated a launch sector into position, one or more grenades are launched from adjacent sector positions. Note that if turret rotation is required by ROS, gunner and commander turret controls are disabled; and automatic rotation for counterfire or turret slewing is temporarily suspended.

As grenades are launched, the inventory of available smoke grenades is decremented. Once all the recommended grenades have been launched, the prioritized threat record is updated so that additional smoke grenades will not be launched towards the same threat; gunner and commander turret controls are reenabled; and automatic rotation for counterfire or turret slewing is resumed.

4.1.3.4.4.2. EO_CM_Simul CSU

EO_CM_Simul serves as the primary entry point for simulation of the MCD, CPS, ATRJ, LCMD, VEMASID, the radar search energy of the FASR sensor and the FLIR energy of the MINE sensor. This module simulates systems which direct electro-optical energy towards a threat.

Because of independent slewing, the center of the electro-optical energy is in one of two directions. In manual mode, the countermeasure slews to be coincident with the direction of the main gun; in an automatic mode, the countermeasure slews to angle of the detected threat.

Electro-optical begins when the countermeasure device arrives at the required azimuth angle and when the reaction/delay time has expired. For manual activation, the jamming energy continues until it is manually deactivated. For automatic activation, the electro-optical continues until the predefined jamming time expires. Furthermore, the prioritized threat record is updated so that jamming energy will not be automatically directed against the same threat.

The radar search energy from the FASR sensor begins only when the corresponding CCDP button is depressed and after the reaction/delay time has expired. The center of radar search energy is always aligned with the main gun. Releasing the FASR button immediately terminates the radar search energy.

The FLIR energy from the MINE sensor begins only when this sensor is available and when the reaction/delay time has expired. Since the MINE sensor is not manually activated/deactivated, the FLIR energy continues as long as the tank is operational.

4.1.3.4.4.3. TCS_Simul CSU

The function TCS_is_Not_Effective serves as the main entry point for the TCS simulation. It is invoked by failure_check_cat_kill (found in the m1_failure module) when it is necessary to compute damages from the impact of a missile or main gun round. If TCS is not available as a countermeasure, damage calculations are computed normally. However, when TCS is available a series of tests are performed to determine if the impact should be ignored.

The first set of tests determine if TCS is in a ready mode. TCS is in a ready mode if the following conditions are satisfied:

a. countermeasures are armed, and
b. the CM mode is automatic, or
   the CM mode is semi-automatic and the commanders thumb switch is engaged, or
c. the CM mode is manual the TCS button is depressed.

If the TCS is in the ready mode, the final set of tests are performed. Conceptually, the hull is divided into quadrants: front right, front left, rear left, rear right. The direction of the velocity vector of the projectile with respect to the hull orientation is used to derive which quadrant's inventory must be examined. If the quadrant's inventory is not depleted, the inventory is reduced by one and TCS has saved the tank crew from a catastrophic kill.

4.1.3.4.4.4. Decon_CM_Simul CSU

Decon_CM_Simul and Poison_Simul serve as the primary entry points for simulating the NBCOP. Identify_Threats registers when a poison is present regardless of the availability of NCS by invoking Contaminant_Exists. When poison is present, Poison_Simul decrements a life-expectancy timer. A catastrophic kill is initiated when the timer expires.

Decontamination begins when the following conditions are satisfied:

a. countermeasures are armed and,
b. the CM mode is automatic, or
   the CM mode is semi-automatic and the commanders thumb switch is engaged, or
c. the CM mode is manual and the NBCOP button is depressed.

For manual activation, the decontamination continues until it is manually deactivated. For automatic activation, the jamming continues until the predefined jamming time expires.

4.1.3.4.4.5. One_Shot_CM_Simul CSU

One_Shot_CM_Simul serves as the primary entry point for Chaff and Flares countermeasure simulation. This module launches chaff or flares to decoy radar directed or infra-red guided/directed missiles and munitions.

Because of independent slewing, the final azimuth launch angle is in one of two directions. In manual mode, the countermeasure slews to be coincident with the direction of the main gun; in an automatic mode, the countermeasure slews to azimuth angle of the detected threat.

Chaff or flares are launched as soon as the countermeasure device arrives at its prescribed angle and when the reaction delay time has expired. For automatic activation, the prioritized threat record is updated so that other countermeasures will not be automatically directed against the same threat. Furthermore, once chaff or flares are launched, the entire chaff or flares inventory is considered to be depleted.

4.1.3.4.4.6. CFire_Simul CSU

CFire_Simul serves as the main entry point of automatic turret slewing for counterfire. This module rotates the turret to aim the main gun in the direction of a threat.

As automatic turret rotation begins the gunner and commander turret controls are disabled. Once the main gun is positioned to the threat azimuth angle, gunner and commander turret controls are reenabled.

As a final note, the main gun is never fired automatically.

4.1.3.4.4.7. Turret_Scanning_Simul CSU

Turret_Scanning_Simul serves as the main entry point of automatic turret slewing. This module rotates the turret within the turret scanning sector.

As automatic turret rotation begins the gunner and commander turret controls are disabled. Only when automatic turret scanning is disabled are the gunner and commander turret controls reenabled.

4.1.3.5. Send_Updates_to_CCDP CSC

Send_Updates_to_CCDP serves as the primary communication channel for sending information updates from the VIDS-GT to the VIDS-PC. The following types of information are sent:

a. changes to the top ten threats.
b. changes to hull or turret orientations.
c. changes to master or turret power states.
d. audible alerts for new or changed threats.
e. changes in expendable countermeasure (ROS, TCS, Chaff/Flares) inventory.

Services provided by existing code are used to package and transmit the messages to the corresponding VIDS-PC.

4.1.3.6. Send_Updates_to_Network CSC

Send_Updates_to_Network serves as the primary communication channel for sending the state of the VIDS-equipped tank to other entities participating within the same simulated battle exercise. The following types of informational messages are sent:

a. the presence of smoke, chaff or flares.
b. the activation/deactivation of electro-optical energy.
c. instrumentation (used only for data collection and analysis).

Only instrumentation messages are sent at regular intervals. However, an instrumentation message will be sent sooner if one of the following conditions exist:

a. the state of the Master or Turret Power changes.
b. the state of the commander's thumb switch changes.
c. the number of threats exceeds the maximum number of displayable icons on the CCDP.
d. turret control is seized or released by VIDS.

Services provided by existing code are used to package and transmit the information to other entities.

4.1.3.7. Need_To_Release_Turret CSU

Need_To_Release_Turret provides a safeguard to release turret control when no threats are present and CM, CFIRE and SCAN modes are in manual.

4.1.3.8. CM_Rotation_Simul CSC

CM_Rotation_Simul supports the need for independently slewing countermeasures. Furthermore, it manages conflicting rotation requests using priorities.

Each independently slewing countermeasure corresponds to an entry in the countermeasure device table. For each invocation of CM_Rotation_Simul, individual countermeasure devices are rotated to the next position by adding the device rotation rate to the current position. The rotation rate can be positive or negative to move a device in a specific angular direction. Because all simulated devices (except VEMASID) are mounted to the turret, hull and turret rotations can accelerate or retard the time required to move a device to a specified angle. However, once the device has arrived, it remains perfectly positioned until a higher priority request is received.

Conflicting requests to rotate a specific countermeasure are handled using priorities. The priority of each countermeasure rotation request is compared to the previous rotation request. Lower priority requests are ignored. A request with equal or higher priority than the current priority takes control of the countermeasure device. The new priority replaces the current priority.

4.1.3.9. Turret_Rotation CSC

Start_Turret_Rotation and Stop_Turret_Rotation serve as the main entry points for automatic turret rotations required by ROS_Simul, CFire_Simul and Turret_Scanning_Simul. Like CM_Rotation_Simul, rotation requests are based upon a priority.

Conflicting requests to rotate the turret or stop the current rotation are handled using priorities. The priority of each turret request is compared to the previous request. Lower priority requests are ignored. A request with greater than or equal to the current priority takes control of the turret. The new priority replaces the current priority.

Start_Turret_Rotation is invoked to initiate automatic turret rotation. The minimum rotation direction is computed using the current and final turret positions when the request satisfies the priority test. The direction is used to compute the sign of the turret rotation increment. It is this increment which is used to modify the current turret position during each execution cycle.

Stop_Turret_Rotation is invoked to terminate automatic turret rotation. Only when the request satisfies the priority test is the automatic turret rotation terminated.

4.1.3.10. VIDS_Shutdown CSC

The VIDS_Shutdown CSC handles the job of shutting down the VIDS simulation. The local Master and Turret Power states are cleared and the final power state message is sent to the CCDP. This has the net effect of forcing the CCDP to redisplay the initial (power off) menu.

Each internal queue is examined and each member is formally deallocated. Once this is complete, memory statistics are written to the main console. The statistics can indicate if there is a memory management problem or if additional memory should be preallocated during the earlier execution of VIDS_Init.

4.1.4. XField CSC

XField handles the low-level simulation of electro-optical energy. XField PDUs retrieved from the network are examined to determine the kind and spatial extent of electro-optical energy. If the VIDS-equipped tank falls within the energy field, the information describing the field is added to an internal list of other fields. Additionally, the presence of clouds (smoke) is used to determine if the field energy is absorbed. If field energy is absorbed, the field is not made available to the higher-level Identify_Threats CSC.

Fields are removed from the list when either an explicit XField PDU defines that the field no longer exists or the specified field lifetime expires.

An XField PDU sent by the VIDS-equipped tank (refer to the EO_Sensor_Simul and One_Shot_CM_Simul CSUs) is tagged appropriately to distinguish it from fields sent by other vehicles. Furthermore this type of field is periodically retransmitted to the network as long as the field is present.

4.1.5. Cloud CSC

Cloud handles the low-level simulation of electro-optic energy absorbing smoke clouds. Smoke Cloud PDUs are initially transmitted to the network by VIDS-equipped tanks (refer to the ROS_Simul CSU) to inform other vehicles that new smoke clouds exist.

Each smoke grenade is simulated as a single cloud. Parameters are supplied which define the smoke type and corresponding spatial dynamics. This allows other vehicles to model the smoke growth, dissipation and interference with electro-optical energy.

Like XFields PDUs, Cloud PDUs are periodically retransmitted to the network as long as the smoke is potentially effective as an obscurant. When the smoke from a grenade is no longer effective, a Cloud PDU is transmitted to the network so that other vehicles can drop it from their internal lists.

4.1.6. Modifications to Existing Code

Modifications to existing code were made to support the VIDS-GT capability. The files and changes follow:

a. m1_main.c
   Added invocation of VIDS_Init in the veh_spec_init function.
   Added invocation of VIDS_File_Read in the veh_spec_startup.
   Added invocation of VIDS_Simul in the veh_spec_simulate.
   Added VIDS_Shutdown to the veh_spec_exit to send a TankPowerStateVariantmsg to the CCDP to turn it off.
   Added a test to determine if the engine was running before invoking VIDS_Simul() to support the NIS-unique detection and identification probabilities.
   Made changes to access new idc_value array element which holds the state of the new commander's thumb switch.
   Inserted field_tick and cloud_tick before VIDS_Simul.
b. m1_turret.c
   Added the set_vids_az function to support automatic turret rotations to specific azimuth angles.
   Added the set_vids_relative function to support final turret angles relative to the tank hull.
   Added the set_vids_north function to support final turret angles relative to true north.
   Added the set_vids_auto_on function to disable the gunner and commander turret rotation controls.
   Added the set_vids_auto_off function to enable the gunner and commander turret rotation controls.
   Added the set_vids_slew_rate function to support the specification of a rotation rate.
   Added the get_vids_rate function to retrieve the current, VIDS-specific turret rotation parameters.
c. proc_a_pkt.c
   Added code to recognize and reformat VIDS (CCDP Control Settings) PDUs.
   Added code to recognize ROS, TCS and Chaff/Flares munition resupply PDUs so the initial supply and placement of expendable countermeasures could be instantly restored.
d. m1_ctl_tpc.c
   Made changes to support the use of a new commander's thumb switch which will be used instead to activate semi-automatic CMs.
e. m1_failure.c
   Added the TCS_is_Not_Effective function to intercept a fatal impact from a missile or projectile.
f. m1_resupp.c

Added code to recognize the ROS, TCS and Chaff/Flares variants of the munition resupply PDU and invoke the corresponding CSC resupply functions.

g. read_pars.c:
Added code to recognize and store the name of the VIDS parameter file.
Added get_vids_data_file to return the name of the VIDS parameter file.

4.2. VIDS-PC Detailed Design

4.2.1. SMI_Init CSC

SMI_Init preallocates dynamic memory structures associated with drawing menus and icons which will be displayed during the execution of the SMI_Simul CSC. Data files are read which define the placement and appearance of buttons and icons as well as the unique identifier (VehicleID) of the corresponding GT. Parameters are read which define active buttons and how long they must be pressed for a corresponding action to be activated. VIDS (Default Sector Setups and Expendable CM Inventory) PDUs sent by the corresponding GT supplies initial values for the alert, countermeasure, safety, scanning and CPS coverage sectors, the list of available sensors and countermeasures and the inventory of the expendable countermeasures. The list of available countermeasures is used assign spare buttons to individual countermeasures. Finally, links are established between buttons and function invocations.

4.2.2. SMI_Simul CSC

SMI_Simul serves as the primary entry point for simulation of the real CCDP. It represents the root of a functional hierarchy which is executed endlessly until a keyboard Control-C or right mouse button event is received. During a single execution cycle, the following high-level functions are executed:

```
Get_Button();
Check_Alarms();
Process_Rcv_PDU();
```

Each of these functions represent a functional sub-hierarchy which is described in the following sections.

4.2.2.1. Get_Button CSU

Get_Button serves the need to monitor button, mouse, and keyboard activity. A right mouse button or keyboard Control-C signals a request to terminate the SMI_Simul CSC by transitioning to SMI_Shutdown. Otherwise, a test is made to determine if a displayed button has been held down. If a button has been held down long enough and it corresponds to a predefined action, the action is initiated through a corresponding function call. The corresponding function may change the current menu, the content of the display, the operating state or a combination of these changes. When a button changes one of the VIDS operating states, a network message is sent to the VIDS-GT to update its corresponding CCDP settings Additionally, when any button state is changed or when a user alert message is displayed, an instrumentation message is sent to the network for data collection and analysis.

4.2.2.2. Check_Alarms CSU

Check_Alarms manages the VIDS alarm tones heard on the tank intercom. The status of each alarm type is checked to determine if it should be activated or terminated. When an alarm is activated, the alarm is heard for a predefined duration. An alarm is terminated when the duration has expired, a termination message was received from the GT or VIDS is powered off.

4.2.2.3. Process_Rcv_PDU CSC

Process_Rcv_PDU manages received network messages. Only messages sent by the corresponding VIDS-GT are processed. All other messages are discarded.

Depending upon the type of message, the display or alarm tones are changed. The message types which change the display include the following:

a. Tank Power State updates.
b. Tank Orientation updates.
c. Prioritized Threat updates.
d. Automatic CM Activation/Deactivation updates.
e. Default Setups.
f. Changes to the inventory of expendable countermeasures.

Only the Alarm Control message type affects what is heard on the tank intercom. Refer to the IDD in section 5 for the exact content of each message type.

4.2.3. SMI_Shutdown CSU

SMI_Shutdown releases memory allocated during SMI_Init and restores the mouse and display behaviors before terminating.

5. CSCI data.

Within the VIDS-GT CSC, there is only one global data element: vids_debug. It a Boolean object which is toggled between two states to either activate or deactivate diagnostic messages. Under normal conditions, vids_debug is false.

Within the VIDS-PC CSC, the following arrays represent global elements:

a. Icon.
b. Threat.
c. Frame.
d. Display.
e. Vary.
f. Buttons.
g. fcnptrs.

These arrays used to support low-level drawing operations. Refer to the following header files for more details:

global.h
alarm.h
buttons.h

The following table lists the type and content of the messages exchanged between the PC, GT and SAF. Additionally, the content of the GT and PC instrumentation messages are included.

[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
CCDP_Control_Settings (sent from CCDP to M1)				
	.Alert_Sector	.Start_Angle	0 to 360 degrees.	Defines the start angle of the alert sector. The start angle is defined relative to the front of the hull. Positive angles are counterclockwise. Threats which fall outside alert sector will be ignored.
		.Delta	0 to 360 degrees.	Defines the angular offset from the start angle. The sector defined by the delta from the start angle is evenly divisible by 15 degrees. If Delta equals zero, threats will not be reported.
	.Safety_Sector	.Start_Angle	0 to 360 degrees.	Defines the start angle of the safety sector. The start angle is defined relative to the front of the hull. Positive angles are counterclockwise. Neither the turret nor any CM will be activated within the Safety Sector.
				Furthermore, the turret will not be automatically slewed into this sector for either Semi or Auto CFire.
		.Delta	0 to 360 degrees.	Defines the angular offset from the start angle. The sector defined by the delta from the start angle is evenly divisible by 15 degrees.
				If Delta equals 0, then no safety region is defined. In other words, countermeasures can be activated/deployed in any direction.
	.Turret_Scanning_Sector	.Start_Angle	0 to 360 degrees.	Defines the start angle of the turret scanning sector. The start angle is defined relative to the front of the hull. Positive angles are counterclockwise.
		.Delta	0 to 360 degrees.	Defines the angular offset from the start angle. The sector defined by the delta from the start angle is evenly divisible by 15 degrees.
				If Delta equals 0, then turret scanning is disabled.
	.CM_Coverage_Sector	.Start_Angle	0 to 360 degrees.	Defines the start angle of the CM coverage sector. The start angle is defined relative to the front of the hull. Positive angles are counterclockwise.
		.Delta	0 to 360 degrees.	Defines the angular offset from the start angle. The sector defined by the delta from the start angle is evenly divisible by 15 degrees.

[illegible] Str[illegible]	Fiel[illegible]	S[illegible]s	Rang[illegible]lues	[illegible]scrip[illegible]
				If Delta equals 0, then no smoke grenades will be fired by a Manual Salvo. A sector defined by Delta which is greater than 0 defines the coverage of smoke grenades when the Salvo button is depressed in Manual mode.
	.CPS_Coverage_Sector	.Start_Angle	0 to 360 degrees.	Defines the start angle of the CPS coverage sector. The angle is defined to be relative to the main gun. Positive angles are counterclockwise.
		.Delta	5 to 120 degrees.	Defines the angular offset from the start angle. The sector defined by the delta from the start angle is evenly divisible by 5 degrees.
	.Manual_Grenade_Salvo			Defines an array which stores the number of smoke grenades to launch for each type of grenade. Smoke grenade type (L8A1, M76, XM81) is used to index into the array. Each array element contains the number of grenades to launch.
	.VIDS_Power_State		Off, On	Defines whether VIDS is on or off. When VIDS is off, only the Salvo and Arm_Safe Buttons operate.
	.Turret_Mode		Manual, Semi, Auto	Defines the turret scanning mode. The turret mode will return to Manual if manually deactivated, or if a threat is detected and CFire_Mode or CM_Mode is Semi or Auto.
	.CFire_Mode		Manual, Semi, Auto	Defines the counterfire mode. Semi or Auto provide for automatic turret slewing and positioning.
	.CM_Mode		Manual, Semi, Auto	Defines the countermeasure mode. Semi and Auto provide for automatic turret slewing and automatic CM activation.
	.Arm_Safe_State		Safe, Armed	Defines the Arm/Safe button state. The state must be Armed before any countermeasure is activated. This state is ignored for all CFire and Turret Scanning modes.
	.ROS_Button_State		Deactivated, Activated	Defines the ROS countermeasure state. The ROS countermeasure may be activated manually or automatically. Manually deactivating the ROS countermeasure immediately terminates either type of activation. Otherwise, deactivation occurs after the
				recommended number of smoke grenades have been launched.
	.MCD_Button_State		Deactivated, Activated	Defines the MCD countermeasure state. The MCD countermeasure may be activated manually or automatically. Manually deactivating the MCD countermeasure immediately terminates either type of
				activation. Manual activation always requires manual deactivation; automatic deactivation follows automatic activation after a predefined delay.

Structure	Fields	SubFields	Range of Values	Descriptions
	.Flares_Button_State		Deactivated, Activated	Defines the Flares countermeasure state. The Flares countermeasure may be activated manually or automatically. Manually deactivating the Flares countermeasure immediately terminates either type of activation. Otherwise, deactivation occurs after the entire inventory of flares has been launched.
	.LCMD_Button_State		Deactivated, Activated	Defines the LCMD countermeasure state. The LCMD countermeasure may be activated manually or automatically. Manually deactivating the LCMD countermeasure immediately terminates either type of activation. Manual activation always requires manual deactivation; automatic deactivation follows automatic activation after a predefined delay.
	.Delete_Threat		SIMNET Vehicle Id	Defines which target to be deleted. A value of 0 means that no manual deletions are required.
	.Selected_Top_Threat		SIMNET Vehicle Id	Defines which target is the top priority. A value of 0 means that no change is required.
	.Threat_Sensor_Filter		LBR, LDES, LRF, ATGM, HELO, TANK	Defines an array of bits which is indexed by LBR, LDES, LRM, ATGM, HELO, TANK. When a bit is set to 1, sensed threats of the specified type will be ignored.
	.Guise_Filter		UNKNOWN, FRIEND, FOE	Defines an array of bits which is indexed UNKNOWN, FRIEND, FOE. When a bit is set to 1, identified threats of the specified type will be ignored.
	.Auto_Activated_CMs		ROS, MCD, CPS, VEMASID, ATRJ, TCS, MFD, NBC, Chaff_Flares, LCMD	The bit map is indexed by CM type. Each array element defines which CM can be automatically activated.
Tank_Power_State (sent from M1 to CCDP)				
	.Master_Power_State		Off, On	Defines the Master Power State. When this is Off, no CCDP button can be "depressed", all lights go out, the display is blanked, and any audible warning tone is terminated.
	.Turret_Power_State		Off, On	Defines the Turret Power State. When this is Off, no CCDP button can be "depressed", all lights go out, the display is blanked, and any audible warning tone is terminated.

Data Structure	Fields	SubFields	Range of Values	Descriptions
Tank_Orientation (sent from M1 to CCDP)				
	.Hull_Orientation		0 to 360 degrees.	Defines the angle of the hull with respect to true North. Positive angles are counterclockwise.
	.Turret_Orientation		0 to 360 degrees	Defines the angle of the turret with respect to the hull. Positive angles are counterclockwise.
Expendable_CM_Inventory (sent from M1 to CCDP)				
	.ROS_Launch_Tubes		[3,24]	Defines an array of smoke grenade totals. The first array element is indexed by L8A1, M76, XM81. Each array element contains the remaining grenades of the specified type in the 24 launch tubes.
				The second array element corresponds to the launch tubes. For simulation, each launch tube is positioned at 15 degree increments with an initial offset of 7.5 degrees from the main gun.
				Note, each tube can launch one of three types of grenades: L8A1, M76, XM81. Grenades can be launched in any order from a simulated tube.
	.Remaining_ROS_Grenades		[3]	Provides a subtotal of remaining grenade types.
	.ROS_Grenade_Angles		[24]	Defines the grenade launch angles. These are used to display smoke grenade icons on the CCDP.
	.Fired_ROS_Grenade_Count		0,24	Defines the number of grenade angles and ultimately the number of smoke grenade icons to display on the CCDP.
	.TCS_Launch_Tubes		[4]	Defines an array of 4 launch tubes where each tube holds 2 expendable TCS CMs.
	.Remaining_TCS			Provides the remaining inventory of TCS.
	.Remaining_Chaff		0,30	Defines the remaining inventory of chaff.
	.Remaining_Flares		0,30	Defines the remaining inventory of decoy flares.
Alarm_Control (sent from M1 to CCDP)				
	.Alarm_Index		1-255	Defines the index into a prerecorded table of alarm tones.
	.Alarm_Activation		Off, On	Defines when the tone is played or terminated.

Data Structure	Fields	SubFields	Range of Values	Descriptions
	.Alarm_Duration		0 - 60	Defines the number of seconds that a warning tone must be heard.
Prioritized_Threats (sent from M1 to CCDP)				
	.Total_Threat_Count		0-65535	Defines the number of recognized threats. Note that only the first 10 threats will be sent to the CCDP, and that the threats will be sent in priority order.
	.Threat_List	.Threat_Type	LRF, LBR, LDES, ATGM, MINE, HCPTR, TANK, SUPPVEH, NBC, UPLINK, SEARCH, TRACK, AH64, OH58D, HAVOC, HIND, HIP	Identifies the type of threat.
		.Vehicle_Id	SIMNET Vehicle Id	Uniquely defines the threat.
		.Azimuth_Angle	0 to 360 degrees	Defines the angle of the threat with respect to true North. Positive angles are counterclockwise.
		.Elevation_Angle	90 to -90 degrees	Defines the angle of the threat with respect to the horizon. Positive angles are above the horizon.
		.Range	0 - 10km	A subset of the sensors report a threat distance.
		.Guise	Friend Foe, Unknown	Defines if the threat is friendly. For the present all, threats are foes.
		.Recommended_CM	NULL, MCD, ROS, CPS, CMINE, ATRJ, TCS, NBCOP, CHAFF, FLARES, LCMD	Defines the recommended CM for automatic activation.
		.ROS (variant)	.Grenade_Type_Array	Defines an array of smoke grenade types. For ROS, the three types are L8A1, M76, XM81. Each array element defines the number of smoke grenades to launch for a given threat.
Auto_CM_State_Change (sent from M1 to CCDP)	.CM_States_Array		ROS, MCD, CPS, VEMASID, ATRJ, TCS, MFD, NBC, Chaff_Flares, LCMD	The array is indexed by CM type. Each array element defines which button/display to light/extinguish when a countermeasure is automatically activated/deactivated.
		.State	Deactivated, Standby, Activated	Defines the automatic activation state of a specific CM. Standby indicates the reaction/delay time period prior to actual activation.
Default_CCDP_Setups (sent from M1 to CCDP)				
	.Alert_Sector	.Start_Angle	0 to 360 degrees.	Defines the start angle of the alert sector. The start angle is defined relative to the *front of the hull*. Positive angles are counterclockwise. Threats which fall outside alert sector will be ignored.
		.Delta	0 to 360 degrees.	Defines the angular offset from the start angle. The sector defined by the delta from the start angle is evenly divisible by 15 degrees.
	.Safety_Sector	.Start_Angle	0 to 360 degrees.	Defines the start angle of the safety sector. The start angle is defined relative to the front of the hull. Positive
				angles are counterclockwise. Neither the turret nor any CM will be activated within the Safety Sector.

Data Structure	Fields	SubFields	Range of Values	Description
		.Delta	0 to 360 degrees.	Defines the angular offset from the start angle. The sector defined by the delta from the start angle is evenly
				If Delta equals 0, then no safety region is defined. In other words, countermeasures can be activated/deployed in any direction.
	.Turret_Scanning_Sector	.Start_Angle	0 to 360 degrees.	Defines the start angle of the turret scanning sector. The start angle is defined to be relative to the front of the hull. Positive angles are counterclockwise.
		.Delta	0 to 360 degrees.	Defines the angular offset from the start angle. The sector defined by the delta from the start angle is evenly divisible by 15 degrees.
				If Delta equals 0, then turret scanning is disabled.
	.CM_Coverage_Sector	.Start_Angle	0 to 360 degrees.	Defines the start angle of the CM coverage sector. The start angle is defined relative to the front of the hull. Positive angles are counterclockwise.
		.Delta	0 to 360 degrees.	Defines the angular offset from the start angle. The sector defined by the delta from the start angle is evenly
				If Delta equals 0, then no smoke grenades will be fired by a Manual Salvo. A sector defined by Delta which is greater than 0 defines the coverage of smoke grenades
	.CPS_Coverage_Sector	.Start_Angle	0 to 360 degrees.	Defines the start angle of the CPS coverage sector. The angle is defined to be relative to the main gun. Positive angles are counterclockwise.
		.Delta	5 to 120 degrees.	Defines the angular offset from the start angle. The sector defined by the delta from the start angle is evenly divisible by 5 degrees.
	.Manual_Grenade_Salvo		[3]	Defines an array which stores the number of smoke grenades to launch for each type of grenade. Smoke grenade type (L8A1, M76, XM81) is used to index into the array. Each array element contains the number of grenades to launch.
	.Available_CMs		ROS, MCD, CPS, VEMASID, ATRJ, TCS, MFD, NBC, Chaff_Flares, LCMD	Defines a bit map indexed by CM type. Each array element defines which CM is available for either manual or automatic activation.
	.Auto_Activated_CMs		ROS, MCD, CPS, VEMASID, ATRJ, TCS, MFD, NBC, Chaff_Flares, LCMD	Defines a bit map indexed by CM type. Each array element defines which CM can be automatically activated.
	.Available_Sensors		LWR, MWS, MFD, SEISMIC, NIS, NCS, TRWR, FASR	Defines a bit map indexed by Sensor type. Each array element defines which Sensor is available for manual activation. Presently, this is used only for FASR.

	.Max_ Threats			Defines the maximum number of threats to be displayed on the CCDP.
XField (exchanged between SAF and VIDS-equipped vehicles)				
	.field_ID		0 to 65535	Uniquely identifies the field.
	.target_ID		SIMNET Vehicle Id	Uniquely defines the target.
	.based_on		Position_Based_On_Vehicle_Hull, Rotation_Based_On_Vehicle_Hull, Rotation_Based_On_Vehicle_Turret, Rotation_Based_On_Vehicle_Gun, Rotation_Based_On_VIDS.	Defines the combination of position and orientation settings for XFields.
	.subtype		Range_Finder_Laser, Beam_Rider_Laser, Designating_Laser, Radar_Jam, Acoustic, IR, MF, ATGM, RADAR_Search, RADAR_Track, RADAR_Uplink, CPS_Laser, Laser_Target_Decoy, Mine_FLIR, Mine_Magnetic, Real_Mine_Illumed, False_Mine_Illumed, FASR_Search,	Defines the type of XField.
			FASR_Illumed,BCIS, Transponder, Nuclear, Biological, Chemical, Flares, Chaff.	
	.type		Unknown, Sector, Omnidirectional, Beam	Defines the XField directionality.
	.location		SIMNET WorldCoordinates	Defines the location of the XField.
	.rotation		9 element rotation matrix	Defines the rotation of the XField. When Rotation_Based_On_VIDS, this matrix defines the vehicle-independent (stabilized) azimuth angle of the XField.
	.velocity		SIMNET VelocityVector	Defines the XField velocity.
	.age		0 to the largest unsigned integer.	Defines the XField age.
	.exp_duration		0 to the largest unsigned integer.	Expected duration (lifetime) of the field.
	.theta_1		0 to 360 degrees.	One of two azimuthal angles which define the field
	.theta_2		0 to 360 degrees.	One of two azimuthal angles which define the field
	.phi_1		0 to 180 degrees.	One of two attitudinal angles which define the field
	.phi_2		0 to 180 degrees.	One of two attitudinal angles which define the field
	.power		0.0 to maximum floating point number.	Defines the total power emitted by the field.
	.frequency		0.0 to maximum floating point number.	Defines the base frequency of the field.
	.theta_sweep_frequency		0.0 to maximum floating point number.	Defines the frequency in Hertz for the theta dynamics to complete a cycle.

D... Structure	Fields	SubFields	Range of Values	Descriptions
	.theta_sweep_amplitude		0.0 to maximum floating point number.	Defines the frequency in Hertz for the theta dynamics to complete a cycle.
	.phi_sweep_frequency		0.0 to maximum floating point number.	Defines the frequency in Hertz for the theta dynamics to complete a cycle.
	.phi_sweep_amplitude		0.0 to maximum floating point number.	Defines the frequency in Hertz for the theta dynamics to complete a cycle.
	.radius		0.0 to maximum floating point number.	Defines radius of the field at the source.
	.k			For future simulations.
Cloud (sent by VIDS-equipped vehicles)				
	.location		SIMNET WorldCoordinates	Defines the location of the smoke cloud in the
	.drift		An array of 3 floating point rates.	Defines the rate (meters/second) at which a cloud moves from its origin.
	.age		0 to maximum floating point number.	Defines the age of the smoke cloud
	.type		Visual_Obscurant, Visual_IR_Obscurant, Millimeter_Wave_Obscurant	Defines the energy absorbing properties of the cloud.
VIDS-GT Instrumentation (sent to the Data Logger)				
	.VehicleID		SIMNET Vehicle Id	Defines which vehicle issued the instrumentation PDU.
	.Sensor_Count		0 to 10	Defines the number of available threats in the Avail_Sensors array.
	.Sensors		[10]	Each element uniquely defines the available sensor.
	.Sensor_Accuracy		[10]	Each element defines the accuracy of the corresponding sensor.
	.CCH_Thumb_Switch		released, depressed	Defines the current state of the Commanders Control Handle thumb switch.
	.Turret_Controlled_by_VIDS		false, true	Defines if VIDS has seized control of the turret.
	.Excess_Threats		0 to 255	Defines the number of detected threats but not currently displayed on the CCDP.
VIDS-PC Instrumentation (sent to the Data Logger)				
	.VehicleID		SIMNET Vehicle Id	Defines which vehicle issued the instrumentation PDU.
	.EventID		SIMNET Event Id	Defines the unique identification number of the PDU.
	.Button		0 to 255	Defines which button is changing state.
	.Menu		0 to 255	Defines which menu the button is on.
	.New_Menu		0 to 255	Defines which menu will be displayed next.
	.Button_State		released, depressed	Defines the state of the button.
	.Alert_Msg		[21]	Holds a copy of the alert message displayed on the CCDP. The string is null terminated.

6. CSCI data files.

Files are not shared between VIDS CSCs or CSUs.

7. Requirements traceability.

The following table depicts the requirements traceability. The requirements are grouped into sections representing incremental refinements. For example, requirements beginning with the number 1 signify Phase 1 requirements; requirements beginning with the number 2 signify Phase 2 requirements.

		4.1.	4.1.1	4.1.2.	4.1.3.	4.1.3.1.	4.1.3.2.	4.1.3.3.	4.1.3.3.1	4.1.3.3.1.1	4.1.3.3.1.2	1.3.3.1.3	1.3.4.	4.1.3.4.1.	4.1.3.4.1.1	4.1.3.4.1.2.	4.1.3.4.1.3.	4.1.3.4.1.4	4.1.3.4.1.5.	4.1.3.4.2.	4.1.3.4.3.	4.1.3.4.4.	4.1.3.4.4.1.	4.1.3.4.4.2.	4.1.3.4.4.3.	4.1.3.4.4.4.	4.1.3.4.4.5.	4.1.3.4.4.6.	4.1.3.4.4.7.	4.1.3.5.	4.1.3.6.	4.1.3.7.	4.1.3.8.	4.1.3.9.	4.1.3.10.	4.1.4.	4.1.5.	4.1.6.	4.2.	4.2.1.	4.2.2.	4.2.2.1.	2.2.2.	2.2.3.	4.2.3.
1	**Provide a VIDS equipped combat vehicle.**																																												
1.1	The VIDS Step 2 activities will modify the BDS-D M1 Simulator to simulate a VIDS equipped combat vehicle providing:																																					X							
1.1.1.	**A simulated VIDS Tactical Display panel.** The layout of the Tactical Display will be based on the examples shown in CBVIDS-004 and the VIDS Functional Specification. All operator actions taken shall be relayed to the Data Logger. The Tactical Display shall provide:																																							X					
1.1.1.1.	A hardware implementation of a VIDS information display and control panel located in the M1 Simulator at the Tank Commander's position.																																						X						
1.1.1.2.	An information display consisting of:																																												
1.1.1.2.1.	The CM Data Field showing the countermeasures available (system and inventory status if applicable).																																								X			X	
1.1.1.2.2.	The CM ARM/SAFE Field showing the current state.																																								X	X			
1.1.1.2.3.	The Threat Position Data Field showing the azimuth, elevation, range, and type of threat data pertaining to highest priority or operator selected threat.																																								X			X	
1.1.1.2.4.	The Mode Indicator showing CM selection and status.																																								X	X			
1.1.1.2.5.	The User Alert Data Field showing applicable VIDS alerts.																																								X	X			
1.1.1.2.6.	The Alert Sector delineating sector where threats can be initially detected.																																								X			X	
1.1.1.2.7.	The Threat Icon Field showing relative azimuth position of the 6 highest priority threats.																																								X			X	
1.1.1.2.8.	The CM Coverage Sector delineating sector in which CM may be directed.																																								X			X	
1.1.1.2.9.	The Safety Coverage Sector delineating sector in which CM may not be dispensed or the turret positioned when in the Automatic or Semi-Automatic Mode. Manually positioning into this sector will result in a User Alert.																																								X			X	

		4.1.	4.1.1	4.1.2.	4.1.3.	4.1.3.1.	4.1.3.2.	4.1.3.3.	4.1.3.3.1	4.1.3.3.1.1	4.1.3.3.1.2	4.1.3.3.1.3	4.1.3.4.	4.1.3.4.1.	4.1.3.4.1.1	4.1.3.4.1.2.	4.1.3.4.1.3.	4.1.3.4.1.4	4.1.3.4.1.5.	4.1.3.4.2.	4.1.3.4.3.	4.1.3.4.4.	4.1.3.4.4.1.	4.1.3.4.4.2.	4.1.3.4.4.3.	4.1.3.4.4.4.	4.1.3.4.4.5.	4.1.3.4.4.6.	4.1.3.4.4.7.	4.1.3.5.	4.1.3.6.	4.1.3.7.	4.1.3.8.	4.1.3.9.	4.1.3.10.	4.1.4.	4.1.5.	4.1.6.	4.2.	4.2.1.	4.2.2.	4.2.2.1.	4.2.2.2.	4.2.2.3.	4.2.3.
1.1.1.2.10.	The Turret Pointer indicating the direction in which the main gun is pointing. Top of display means same as front of hull.																																								■			■	
1.1.1.2.11.	The Hull Pointer indicating the top of the display.																																								■			■	
1.1.1.2.12.	The Programmable Turret Limits delineating the limits of turret SCAN.																																								■			■	
1.1.1.2.13.	*The Menu Choice Field indicating the current function* represented by each of the PFKs. When a PFK is selected the corresponding field shall be back lighted on the display.																																							■	■	■			
1.1.1.3.	The control panel shall contain fourteen Fixed Function Keys (FFKs) suitable *for* controlling the use of the VIDS. Sufficient functionality shall be provided to allow the *following* actions. Unused FFKs shall be labeled "SPARE". Activating a SPARE or any illegal action shall result in a User Alert.																																							■	■	■			
1.1.1.3.1.	POWER - Control whether VIDS is in the Off as opposed to the other Operational Modes. When power is Off none of the PFKs and only the ARM/SAFE and SMOKE GRENADE LAUNCH (SALVO) actions are functional. Transition out of Off Mode is to Manual, the top level menu is shown, and all setups are at default values.																																								■	■			
1.1.1.3.2.	ARM/SAFE - Allows/Disallows use of CM. If VIDS is Off Allows/Disallows use of smoke grenades. Activation of any CM is disallowed when it is in the SAFE condition and will result in a User Alert.																																								■	■			
1.1.1.3.3. (revised for phase 2)	SMOKE GRENADE LAUNCH (ROS) - When VIDS is Off this FFK dispenses 4 smoke grenades centered around the line of sight of the main gun. When VIDS is Manual this FFK dispenses Setup selected (or initial default) number and type of grenades. This capability is illegal if system is in SAFE condition (a User Alert results).																					■																			■	■			
1.1.1.3.4.	MAIN - Puts up the top level menu and sets VIDS to the Manual Mode. Any setup actions are preserved.																																								■	■			
1.1.1.3.5.	ENTER - Activates previous PFK selection. If no PFK is selected menu goes up one level. Attempts to go up from the top menu will result in a User Alert.																																								■	■			
1.1.1.3.6.	TARGET SELECT - Causes the currently selected target to be deleted and the next highest to be selected.						■																																		■	■			

		4.1.	4.1.1	4.1.2.	4.1.3.	4.1.3.1.	4.1.3.2.	4.1.3.3.	4.1.3.3.1	4.1.3.3.1.1	4.1.3.3.1.2	4.1.3.3.1.3	4.1.3.4.	4.1.3.4.1.	4.1.3.4.1.1	4.1.3.4.1.2.	4.1.3.4.1.3.	4.1.3.4.1.4	4.1.3.4.1.5.	4.1.3.4.2.	4.1.3.4.3.	4.1.3.4.4.	4.1.3.4.4.1.	4.1.3.4.4.2.	4.1.3.4.4.3.	4.1.3.4.4.4.	4.1.3.4.4.5.	4.1.3.4.4.6.	4.1.3.4.4.7.	4.1.3.5.	4.1.3.6.	4.1.3.7.	4.1.3.8.	4.1.3.9.	4.1.3.10.	4.1.4.	4.1.5.	4.1.6.	4.2.	4.2.1.	4.2.2.	4.2.2.1.	4.2.2.2.	4.2.2.3.	4.2.3.
1.1.1.3.7.	SCROLL UP - Selects the next highest priority target without deleting the current. Attempts to select UP from the highest will result in a User Alert.																			■																					■	■			
1.1.1.3.8.	SCROLL DOWN - Selects the next lowest priority target without deleting the curret. Attempts to select DOWN from the lowest will result in a User Alert.																			■																					■	■			
1.1.1.3.9. (revised for phase 2)	MCD - Used in the Manual Mode to activate the MCD system. If system is in SAFE condition a User Alert results.																					■																			■	■			
1.1.1.3.10. (revised for phase 2)	CM OFF - Pressing ROS or MCD while they are active manually deactivates the CM.																					■																			■	■			
1.1.1.4.	The control panel shall contain five Programmable Function Keys (PFKs) for use in changing VIDS states, menu selection and/or traversing, and performing Setup functions. PFK selections will not be activated until the ENTER function is activated. The top level menu shall offer a choice between NORM (fight the war) and SETUP.																																								■	■			
1.1.1.4.1.	NORM - Provide for placing SCAN, CM, and/or Counterfire into the Semi-Automatic or Automatic Mode as described in CBVIDS-004 (modified by follow-up data).																																								■	■			
1.1.1.4.2.	SETUP - Provide Setup Menus and actions compatible to that described in CBVIDS-004 where possible.																																								■	■			
1.1.2.	Sensor Simulations. VIDS Step 2 will simulate the Laser Warning Receiver (LWR) and the Missile Warning System (MWS). Each sensor simulation shall:									■	■	■																																	
1.1.2.1.	Monitor the exercise to determine the occurrence of any activity which can be sensed.								■																																				
1.1.2.2.	Apply processing and response times to simulate realistic sensor reaction.									■																																			
1.1.2.3.	Apply probability of detection numbers to the sensed entity to simulate the sensor's effectiveness.										■																																		
1.1.2.4.	For detected activities disclose the presence of the activity and what this sensor knows about it for further VIDS processing.										■																																		
1.1.2.5.	Maintain sensor characteristics such as processing time and probability of detection as parameters so that they may be easily modified before an exercise.		■																																										

		4.1.	4.1.1	4.1.2.	4.1.3.	4.1.3.1.	4.1.3.2.	4.1.3.3.	4.1.3.3.1	4.1.3.3.1.1	4.1.3.3.1.2	1.3.3.1.3	1.3.4.	4.1.3.4.1.	4.1.3.4.1.1	4.1.3.4.1.2.	4.1.3.4.1.3.	4.1.3.4.1.4	4.1.3.4.1.5.	4.1.3.4.2.	4.1.3.4.3.	4.1.3.4.4.	4.1.3.4.4.1.	4.1.3.4.4.2.	4.1.3.4.4.3.	4.1.3.4.4.4.	4.1.3.4.4.5.	4.1.3.4.4.6.	4.1.3.4.4.7.	4.1.3.5.	4.1.3.6.	4.1.3.7.	4.1.3.8.	4.1.3.9.	4.1.3.10.	4.1.4.	4.1.5.	4.1.6.	4.2.	4.2.1.	4.2.2.	4.2.2.1.	2.2.2.	2.2.3.	4.2.3.
1.1.3.	Countermeasure Simulations. The VIDS Step 2 will simulate the Multi-Salvo Smoke Grenade Launcher / Rapid Obscuration System (ROS) and the Missile Countermeasure Device (MCD).																																												
1.1.3.1.	The ROS simulation shall:																																												
1.1.3.1.1.	Be capable of deploying any of the three types of smoke as defined in the VIDS Functional Specification. When deployment requires turret motion deployment shall delay until the turret is positioned.																																												
1.1.3.1.2.	Initiate and maintain for each smoke deployment the location of the effective volume of the smoke screen created for the effective duration of the smoke screen. Communicate the presence and characteristics of this smoke screen to all participants in the exercise.																																												
1.1.3.1.3.	Initiate an appropriate visual effect for the smoke screen being generated and communicate to all participants in the exercise.																																												
1.1.3.2.	The MCD simulation shall be capable of deploying an IR jamming field as defined in the VIDS Functional Specification and communicating the presence and characteristics of this field to all participants in the exercise.																																												
1.1.3.3.	Characteristics of the ROS and MCD simulations such as processing and/or deployment times shall be implemented as parameters so that they may be easily modified before an exercise.																																												
1.1.4.	Countermeasures Management. VIDS Step 2 shall:																																												
1.1.4.1.	Monitor all disclosed data from activities as perceived by the sensors and:																																												
1.1.4.1.1.	Perform correlation of newly disclosed data with data from previous disclosures.																																												
1.1.4.1.2.	Perform fusion of data from different sensor's disclosures of the same or related activities.																																												
1.1.4.2.	Use the correlated and fused data to maintain knowledge of all sensed entities and known links between weapons and launching platforms.																																												
1.1.4.3.	Use knowledge of sensed entities to prioritize threats.																																												

		4.1.	4.1.1	4.1.2.	4.1.3.	4.1.3.1.	4.1.3.2.	4.1.3.3.	4.1.3.3.1	4.1.3.3.1.1	4.1.3.3.1.2	1.3.3.1.3	1.3.4.	4.1.3.4.1.	4.1.3.4.1.1	4.1.3.4.1.2.	4.1.3.4.1.3.	4.1.3.4.1.4	4.1.3.4.1.5.	4.1.3.4.2.	4.1.3.4.3.	4.1.3.4.4.	4.1.3.4.4.1.	4.1.3.4.4.2.	4.1.3.4.4.3.	4.1.3.4.4.4.	4.1.3.4.4.5.	4.1.3.4.4.6.	4.1.3.4.4.7.	4.1.3.5.	4.1.3.6.	4.1.3.7.	4.1.3.8.	4.1.3.9.	4.1.3.10.	4.1.4.	4.1.5.	4.1.6.	4.2.	4.2.1.	4.2.2.	4.2.2.1.	2.2.2.	2.2.3.	4.2.3.
1.1.4.4.	Indicate on the Tactical Display the highest priority or operator selected threat by blinking the associated icon.																													■											■				
1.1.4.5.	Determine if CM should be applied to selected threat and indicate recommendation on the display by backlighting in the CM Data Field.																		■											■											■				
1.1.4.6. (revised for phase 2)	Determine if Counterfire should be directed against selected threat. *If AUTOMATIC or if SEMI-AUTOMATIC and the thumb switch is depressed initiate any needed turret*					■															■																								
1.1.4.7. (revised for phase 2)	Determine if Scan is activated. If AUTOMATIC or if SEMI-AUTOMATIC and the thumb switch is depressed initiate turret movement. Suspend scanning during Counterfire or CM activity.					■															■																								
1.1.4.8.	Provide a ROS initiation capability when grenades are available and CM is armed.					■															■	■																							
1.1.4.8.1.	When in the OFF Mode provide capability of manual firing of four grenades centered about line of sight of the main gun.					■															■	■																							
1.1.4.8.2.	When in the MANUAL Mode provide capability of manual firing of pre-programmed (or default) type number, and coverage of grenades.					■															■	■																							
1.1.4.8.3. (revised for phase 2)	When in the SEMI-AUTOMATIC or AUTOMATIC Mode and ROS is the recommended CM select stores, salvos, and coverage based upon selected threat type and inventory. If AUTOMATIC or if thumb switch depressed initiate any needed turret movement and initiate firing and initiate firing of grenades.					■															■	■																							
1.1.4.9.	Provide an MCD initiation capability when CM is armed.					■															■		■																						
1.1.4.9.1.	When in the OFF Mode MCD is not available.					■															■		■																						
1.1.4.9.2. (revised for phase 2)	When in the MANUAL Mode provide capability of manual initiation of MCD using MCD button.					■															■		■																						
1.1.4.9.3.	When in the SEMI-AUTOMATIC or AUTOMATIC Mode and MCD is recommended CM, initiate use of MCD if AUTOMATIC or if palm switch depressed.					■																■		■																					
1.1.4.9.4.	Discontinue use of MCD when CM OFF action taken.					■																■		■																					
1.1.4.10.	An audible alarm shall be initiated upon determination of certain existing threats (as defined in the VIDS Functional Specification) or immediately proceeding an automatic turret movement for Counterfire or CM deployment.									■																				■															

		4.1.	4.1.1	4.1.2.	4.1.3.	4.1.3.1.	4.1.3.2.	4.1.3.3.	4.1.3.3.1	4.1.3.3.1.1	4.1.3.3.1.2	4.1.3.3.1.3	4.1.3.4.	4.1.3.4.1.	4.1.3.4.1.1	4.1.3.4.1.2.	4.1.3.4.1.3.	4.1.3.4.1.4	4.1.3.4.1.5.	4.1.3.4.2.	4.1.3.4.3.	4.1.3.4.4.	4.1.3.4.4.1.	4.1.3.4.4.2.	4.1.3.4.4.3.	4.1.3.4.4.4.	4.1.3.4.4.5.	4.1.3.4.4.6.	4.1.3.4.4.7.	4.1.3.5.	4.1.3.6.	4.1.3.7.	4.1.3.8.	4.1.3.9.	4.1.3.10.	4.1.4.	4.1.5.	4.1.6.	4.2.	4.2.1.	4.2.2.	4.2.2.1.	4.2.2.2.	4.2.2.3.	4.2.3.
1.1.5.	Selective Initialization. - VIDS Step 2 shall:																																												
1.1.5.1.	Provide a capability to selectively load any combinnlion of the implemented VIDS Sensor and Countermeasures at initialization.																																												
1.1.5.2.	*Allow modification of recommended threat to countermeasure pairing at initialization.*																																												
1.2	**Provide VIDS threat platforms and Weapons Systems. The VIDS Step 2 activities will modify the BDS-D SAFOR so that it can be used to evaluate the effectiveness and suitability of the VIDS survivability suites by providing:**																																												
1.2.1.	New Simulated Threat Platforms. VIDS Step 2 shall modify the performance characteristics of existing BDS-D SAFOR *platforms to simulate the T-80 , the Mi-24/HIND/F, and the* BRDM-2 to meet the specifications of the VIDS Functional Specification.																																												
1.2.2.	New *Simulated* Weapons Systems. VIDS Step 2 shall:																																												
1.2.2.1.	Modify the existing BDS-D HEAT and SABOT tank rounds to meet the specifications of the VIDS Functional Specification.																																												
1.2.2.2.	Modify the existing BDS-D TOW missile to meet the specifications of the VIDS Functional Specification for simulation of the US. Hellfire and Soviet AT-2C. AT-4, AT-6, AT-9, and AT-11 ATGMs.																																												
1.2.2.3.	Have weapons systems using laser designators, laser beam riding, laser range finders, laser jammers, or other laser uses communicate the presence and characteristics of this activity to all participants in the exercise.																																												
1.2.2.4.	Have missiles using their booster/sustainer, large caliber gun firings or other systems producing intense optically sensible fields communicate the presence and characteristics of this activity to all participants in the exercise.																																												
1.2.2.5.	Have weapons systems using RF uplink, track or search radar, or other RF uses communicate the presence and characteristics of this activity to all participants in the exercise.																																												
1.2.2.6.	deleted.																																												

		4.1.	4.1.1	4.1.2.	4.1.3.	4.1.3.1.	4.1.3.2.	4.1.3.3.	4.1.3.3.1	4.1.3.3.1.1	4.1.3.3.1.2	1.3.3.1.3	.1.3.4.	4.1.3.4.1.	4.1.3.4.1.1	4.1.3.4.1.2.	4.1.3.4.1.3.	4.1.3.4.1.4	4.1.3.4.1.5.	4.1.3.4.2.	4.1.3.4.3.	4.1.3.4.4.	4.1.3.4.4 [illegible]	[illegible]	[illegible]	4.1.3.4.4.4.	4.1.3.4.4.5.	4.1.3.4.4.6.	4.1.3.4.4.7.	4.1.3.5.	4.1.3.6.	4.1.3.7.	4.1.3.8.	4.1.3.9.	4.1.3.10.	4.1.4.	4.1.5.	4.1.6.	4.2.	4.2.1.	4.2.2.	4.2.2.1.	2.2.2.	2.2.2.3.	2.3.
1.2.2.7.	Have all weapon systems monitor the exercise to determine the occurrence of any non-tangible field produced by CM or other systems which could have an effect on its operation and use the data to modify their behavior accordingly.																																												
1.2.2.8.	Maintain CM characteristics such as time needed to defeat and probability of effectiveness as parameters so that they may be easily modified before an exercise.																																												
1.2.3.	Selective Initialization. VIDS Step 2 shall:																																												
1.2.3.1.	Provide a capability to selectively load any combination of the imple[illegible]nted VIDS SAFOR simulated threat platforms for an exercise.																																												
1.2.3.2.	Provide a capability to selectively load the VIDS SAFOR simulated threat platforms with the implemented VIDS weapons systems for an exercise.																																												
1.3	**Provide VIDS Logistics. The VIDS Step2 activities will modify the existing BDS-D logistics to provide:**																																												
1.3.1.	M1 Simulator Expendables Re-Supply Logistic support shall be provided for the M1 at the Battlemaster position which shall have the capability to re-constitute the M1 in place.																					■															■							
1.3.2.	deleted.																																												
2	**Provide a fully equipped VIDS equipped combat vehicle.**																																												
2.1	The updated Tactical Display shall provide the following:																																												
2.1.1	Show any combination of the following available CMs in the CM Select Field: VIS (ROS), IR (ROS), MMW (ROS), MCD, CPS, CMINE, ATRJ, TCS, NBCOP, Chaff/Flares, LCMD.																																							■			■	
2.1.2	Show Auto Mode enabled/disabled status for each available CM.																																							■				
2.1.3	For VIS, IR, and MMW show number of grenades to be dispensed by a Manual activation in the CM Select Field.																																							■				
2.1.4	For CPS, show Field of Regard (in degrees).																																							■				
2.1.5	When Chaff/Flares is an available CM, show the current inventory in the CM Stores Field.																																							■				
2.1.6	Backlight the CM the TRM recommends (or is using) for the highest priority threat.																																							■				

		4.1.	4.1.1	4.1.2.	4.1.3.	4.1.3.1.	4.1.3.2.	4.1.3.3.	4.1.3.3.1	4.1.3.3.1.1	4.1.3.3.1.2	4.1.3.3.1.3	4.1.3.4.	4.1.3.4.1.	4.1.3.4.1.1	4.1.3.4.1.2.	4.1.3.4.1.3.	4.1.3.4.1.4	4.1.3.4.1.5.	4.1.3.4.2.	4.1.3.4.3.	4.1.3.4.4.	4.1.3.4.4.1.	4.1.3.4.4.2.	4.1.3.4.4.3.	4.1.3.4.4.4.	4.1.3.4.4.5.	4.1.3.4.4.6.	4.1.3.4.4.7.	4.1.3.5.	4.1.3.6.	4.1.3.7.	4.1.3.8.	4.1.3.9.	4.1.3.10.	4.1.4.	4.1.5.	4.1.6.	4.2.	4.2.1.	4.2.2.	4.2.2.1.	4.2.2.2.	4.2.2.3.	4.2.3.
2.2	When TCS is an available CM, show the current inventory in the CM Stores Field.																																								■				
2.3	Provide the following new threat types in the Threat Position Field: MINE, GUN, HCPTR, TANK, SUPPVEH, NBC CHEM, UPLINK, SEARCH, TRACK																																								■				
2.4	Provide dynamic mapping between available countermeasures and SPARE FFKs. Assume maximum of 6 without FASR, otherwise 5 with FASR.																																							■	■				
2.5	Provide dynamic mapping between SPARE FFK and FASR when it is an available sensor.																																							■	■				
2.6	Add CPS sector setup menu.																																								■				
2.7	Provide menu to enable/disable auto activation of CMs.																																								■	■			
2.8	Change Threat icons to indicate tank or helicopter.																																								■				
2.9	Allow muzzle flash as modifier.																																								■				
2.10.	Indicate detected mines.																																								■				
2.11	Indicate the positions of recently fired smoke grenades in the Threat Icon Field.																																								■				
2.11.1	Delete the fired grenade icon after n seconds, where n is a parameter.																																							■	■				
2.12	Use SoundBlaster for all warning tones and voice signals.																																								■				
2.13	Provide the following CPS CM functions:																																												
2.13.1	When CPS is available, the TRM needs to decide if the CPS is to be used to counter a threat.																		■																										
2.13.2	When properly coordinated with the TC, the M1 VIDS needs to issue the jamming field with a sector size as set by the TC (from 5 to 120 degrees).																			■	■		■																						
2.14	Provide the following TRWR sensor functions:																																												
2.14.1	When TRWR is available, sense the presence of RADAR energy.								■	■	■																																		
2.14.2	Supply RADAR threat reports to the TRM.									■																																			
2.15	Provide the following MINE sensor functions:																																												
2.15.1	When MINE is available, sense the presence of real and false mines.								■	■	■																																		
2.15.2	Supply real and false mine threat reports to the TRM.									■																																			
2.15.3	Apply the vehicle brakes when a mine is detected.									■																																			
2.16	Provide the following VEMASID CM functions.																																												

		4.1.	4.1.1	4.1.2.	4.1.3.	4.1.3.1.	4.1.3.2.	4.1.3.3.	4.1.3.3.1	4.1.3.3.1.1	4.1.3.3.1.2	1.3.3.1.3	.1.3.4.	4.1.3.4.1.	4.1.3.4.1.1	4.1.3.4.1.2.	4.1.3.4.1.3.	4.1.3.4.1.4	4.1.3.4.1.5.	4.1.3.4.2.	4.1.3.4.3.	4.1.3.4.4.	4.1.3.4.4.1.	4.1.3.4.4.2.	4.1.3.4.4.3.	4.1.3.4.4.4.	4.1.3.4.4.5.	4.1.3.4.4.6.	4.1.3.4.4.7.	4.1.3.5.	4.1.3.6.	4.1.3.7.	4.1.3.8.	4.1.3.9.	4.1.3.10.	4.1.4.	4.1.5.	4.1.6.	4.2.	4.2.1.	4.2.2.	4.2.2.1.	2.2.2.	2.2.3.	4.2.3.
2.16.1	When VEMASID is available, the TRM needs to decide if the VEMASID is to be used to counter a mine threat.																			X																									
2.16.2	When properly coodinated with the TC, the M1 VIDS will be able to initiate a VEMASID CM action and broadcast the presence of the VEMASID field.																					X		X																					
2.17	Provide the following ATRJ CM functions:																																												
2.17.1	When ATRJ is available, the TRM needs to decide if the ATRJ is to be used to counter a threat.																			X																									
2.17.2	When properly coordinated with the TC, the M1 VIDS needs to issue the jamming field.																					X		X																					
2.18	Provide the following FASR sensor functions:																																												
2.18.1	When FASR is available, sense the radar search returns.									X	X	X																																	
2.18.2	When properly coordinated with the TC, the M1 VIDS shall be able to broadcast the presence of the RADAR search field.																					X		X																					
2.18.3	When ATRJ energy is present, all new and updated FASR threat reports shall be discarded.							X																																					
2.19	Provide the following TCS CM functions:																																												
2.19.1	When TCS is available, determine if a missile or projectile impact has been intercepted/defeated by TCS.																								X																				
2.19.2	Resupply the TCS inventory through Battlemaster or keyboard command.																								X													X							
2.20.	Provide the following NIS sensor functions:																																												
2.20.1	When NIS is available, sense the presence of helicopters.									X	X	X																																	
2.20.2	Support the detection and identification of helicopters by type and supply reports to the TRM.										X																																		
2.20.2.1	Make detection and identification dependent upon the M1 engine state.										X																																		
2.21	Provide the following MFD functions:																																												
2.21.1	When MFD is available, sense the presence of main gun muzzle flashes.									X	X	X																																	
2.21.2	Supply muzzle flash threat reports to the TRM.										X																																		
2.22	Provide the following NBC sensor functions:																																												
2.22.1	When NBC is available, sense the presence of chemical, nuclear or biological poisonous gases.									X	X	X																																	
2.22.2	Kill the tank if poison exists even if NBC is not available.																									X																			
2.22.2.1	Use a maximum exposure time to determine when to kill the tank.																									X																			
2.23	Provide the following NBCOP CM functions:																																												

		4.1.	4.1.1	4.1.2.	4.1.3.	4.1.3.1.	4.1.3.2.	4.1.3.3.	4.1.3.3.1	4.1.3.3.1.1	4.1.3.3.1.2	4.1.3.3.1.3	4.1.3.4.	4.1.3.4.1.	4.1.3.4.1.1	4.1.3.4.1.2.	4.1.3.4.1.3.	4.1.3.4.1.4	4.1.3.4.1.5.	4.1.3.4.2.	4.1.3.4.3.	4.1.3.4.4.	4.1.3.4.4.1.
2.23.1	When NBCOP is available, the TRM needs to decide if the NBCOP is to be used to counter a poison threat.																			X			
2.23.2	When properly coodinated with the TC, the M1 VIDS will be able to activate the NBCOP.																						
2.23.2.1	Activation of NBCOP shall extend the exposure time to a detected poison.																						
2.24	Provide the following Chaff/Flares CM functions:																						
2.24.1	When Chaff/Flares are available, the TRM needs to decide if they are to be used to counter a threat.																			X			
2.24.2	When properly coodinated with the TC, the M1 VIDS will be able to initiate a Chaff/Flares CM action and broadcast their presence.																						
2.24.3	Resupply the Chaff/Flares inventory through Battlemaster or keyboard command.																						
2.25	Provide the following LCMD CM functions:																						
2.25.1	When LCMD is available, the TRM needs to decide if the LCMD is to be used to counter a threat.																			X			
	When properly coordinated with the TC, the M1 VIDS needs to issue the false target field.																						
2.26	Provide the following TRM functions:																						
2.26.1	The TRM shall correlate and fuse threat reports from any combination of new sensors.														X	X							
2.26.2	The TRM shall use the correlated information to make decisions as to type, priority and recommended CM to be used against the threat.															X	X			X			
2.26.3	The TRM shall initiate CCDP updates based upon inputs from the new sensors.																	X	X				
2.27	PDUs shall be used to communicate the presence of electro-optical energy.																						
2.28	An instrumentation PDU shall identify when there are excess threat reports.																						
2.29	CMs shall be activated in parallel against multiple threats.																					X	
2.30.	Semi-Auto activation shall be initiated with a thumb switch instead of the existing TC palm switch.																						
2.31	Auto CFire shall be initiated after Auto CM.																					X	
2.32	Turret control shall be released after the completion of an AUTO rotation.																						X
2.33	All slewable CMs (except ROS) shall slew independently of the turret and from each other.																						

	4.1.3.4.4.2.	4.1.3.4.4.3.	4.1.3.4.4.4.	4.1.3.4.4.5.	4.1.3.4.4.6.	4.1.3.4.4.7.	4.1.3.5.	4.1.3.6.	4.1.3.7.	4.1.3.8.	4.1.3.9.	4.1.3.10.	4.1.4.	4.1.5.	4.1.6.	4.2.	4.2.1.	4.2.2.	4.2.2.1.	4.2.2.2.	4.2.2.3.	4.2.3.
2.23.1																						
2.23.2			X																			
2.23.2.1			X																			
2.24																						
2.24.1																						
2.24.2				X																		
2.24.3													X									
2.25																						
2.25.1																						
	X												X									
2.26																						
2.26.1																						
2.26.2																						
2.26.3							X															
2.27													X									
2.28								X														
2.29										X												
2.30.															X							
2.31																						
2.32					X	X					X											
2.33	X																					

		4.1.	4.1.1	4.1.2.	4.1.3.	4.1.3.1.	4.1.3.2.	4.1.3.3.	4.1.3.3.1	4.1.3.3.1.1	4.1.3.3.1.2	1.3.3.1.3	1.3.4.	4.1.3.4.1.	4.1.3.4.1.1	4.1.3.4.1.2.	4.1.3.4.1.3.	4.1.3.4.1.4	4.1.3.4.1.5.	4.1.3.4.2.	4.1.3.4.3.	4.1.3.4.4.	4.1.3.4.4.1.	4.1.3.4.4.2.	4.1.3.4.4.3.	4.1.3.4.4.4.	4.1.3.4.4.5.	4.1.3.4.4.6.	4.1.3.4.4.7.	4.1.3.5.	4.1.3.6.	4.1.3.7.	4.1.3.8.	4.1.3.9.	4.1.3.10.	4.1.4.	4.1.5.	4.1.6.	4.2.	4.2.1.	4.2.2.	4.2.2.1.	2.2.2.	2.2.3.	2.3.
2.33.1	Auto slewing shall rotate the CM to the detected threat azimuth and remain positionally stabilized until the CM is deactivated.																							■																					
2.33.2	Manual slewing shall rotate the CM to be coincident with the main gun and remain positionally stabilized until the CM is deactivated or until the CM is automatically activated.																							■																					

8. Notes.

Acronyms	Definitions
ATRJ	Advanced Threat Radar Jammer
AVSE	Armored Vehicle Survivability Equipment
CCDP	Commander's Controls Display Panel
CFIRE	Counterfire
CM	Countermeasure
CPS	Combat Protection System
CSC	Computer Software Component
CSCI	Computer Software Configuration Item
CSU	Computer Software Unit
FASR	Future Armored System Radar
FLIR	Forward Looking Infrared
GT	Graphics Technologies
IDD	Interface Description Document
LCMD	Laser Countermeasure Device
LWR	Laser Warning Receiver
MCC	Management Command and Control
MCD	Missile Countermeasure Device
MFD	Muzzle Flash Detector
MWS	Missile Warning System
NBCOP	Nuclear Biological Chemical Overpressure System
NCS	Nuclear Chemical Sensor
NIS	Non-Imaging Sensor
PC	Personal Computer
ROS	Rapid Obscuration System
SAF	Semi-Automated Forces
SCC	Simulation Control Console
SIMNET	Simulation Network
SMI	Soldier Machine Interface
TCS	Threat Countermeasure System
TRWR	Tank Radar Warning Receiver
VehicleID	An integer triplet consisting of site, host and vehicle numbers. Used to uniquely identify an entity within a battle exercise.
VEMASID	Vehicle Magnetic Signature Duplication
VIDS	Vehicle Integrated Defense System

Appendix A. Sensor/Countermeasure Configuration File Content

```
# This is the VIDS data file. It is read at startup.
# All data elements are preceded by a label. After the label
# there will be one or more data values which will be delimited
# by tabs. Any characters inserted between tabs will be
# considered to be a data value (even a blank space).
#
# All time, angular measurements, probabilities and distances
# are defined as floating point values.
#
VIDS_Console_Site	1
VIDS_Console_Host	10
VIDS_Console_Vehicle	1
#
Available_Sensors	LWR	MWS	FASR	MFD	NCS	NIS	TRWR	MINE
Available_CMs	MCD	ROS	CMINE	TCS	NBCOP
Auto_Activated_CMs	MCD	ROS	CMINE	TCS	NBCOP
#
Max_Threats	10
#
VIDS_Processing_Delay	0.2
#
# Sensor Parameters
#
MWS.Response_Time_in_sec	1.2
MWS.Alarm_Duration_in_sec	3.0
MWS.Max_Detection_Distance_in_meter	6000.0
MWS.Max_Approach_Angle_in_Deg	22.5
MWS.Azimuth_Coverage_Central_Angle_in_Deg	0.0
MWS.Azimuth_Coverage_Delta_in_Deg	180.0
MWS.Elevation_Coverage_Central_Angle_in_Deg	15.0
MWS.Elevation_Coverage_Delta_in_Deg	25.0
MWS.Detection_Probability	0.98
MWS.Detection_Accuracy_in_Deg	2.0
MWS.Life_Countdown_in_sec	30.0
#
LWR.Response_Time_in_sec	0.5
LWR.Alarm_Duration_in_sec	3.0
LWR.Azimuth_Coverage_Central_Angle_in_Deg	0.0
LWR.Azimuth_Coverage_Delta_in_Deg	180.0
LWR.Elevation_Coverage_Central_Angle_in_Deg	15.0
LWR.Elevation_Coverage_Delta_in_Deg	25.0
LWR.Detection_Probability_LRF	0.92
LWR.Detection_Probability_LBR	0.97
LWR.Detection_Probability_LDES	0.97
LWR.Detection_Accuracy_in_Deg	3.0
LWR.Life_Countdown_in_sec	30.0
#
FASR.Response_Time_in_sec	0.5
FASR.Alarm_Duration_in_sec	3.0
FASR.Max_Detection_Distance_in_meter	5000.0
FASR.Azimuth_Coverage_Central_Angle_in_Deg	0.0
FASR.Azimuth_Coverage_Delta_in_Deg	10.0
FASR.Elevation_Coverage_Central_Angle_in_Deg	0.0
FASR.Elevation_Coverage_Delta_in_Deg	5.0
FASR.Detection_Probability	0.95
FASR.Identification_Probability	0.90
FASR.Detection_Accuracy_in_Deg	1.0
FASR.Update_Frequency_in_sec	5.0
FASR.Life_Countdown_in_sec	60.0
#
MINE.Response_Time_in_sec	0.2
MINE.Alarm_Duration_in_sec	2.0
MINE.Max_Detection_Distance_in_meter	36.5
MINE.Azimuth_Coverage_Central_Angle_in_Deg	0.0
MINE.Azimuth_Coverage_Delta_in_Deg	11.8
MINE.Elevation_Coverage_Central_Angle_in_Deg	-43.51
MINE.Elevation_Coverage_Delta_in_Deg	1.49
MINE.Detection_Probability_Real	0.90
MINE.Detection_Probability_False	0.10
MINE.Detection_Accuracy_in_Deg	0.0
MINE.Life_Countdown_in_sec	30.0
#
NIS.Response_Time_in_sec	4.0
NIS.Alarm_Duration_in_sec	3.0
```

```
NIS.Azimuth_Coverage_Central_Angle_in_Deg          0.0
NIS.Azimuth_Coverage_Delta_in_Deg                  180.0
NIS.Elevation_Coverage_Central_Angle_in_Deg        0.0
NIS.Elevation_Coverage_Delta_in_Deg                60.0
NIS.Detection_Distances_Engine_Off                 5000.0  7000.0  10000.0  12000.0  15000.0  18000.0
NIS.Detection_Probabilities_Engine_Off             1.0     0.93    0.90     0.85     0.73     0.50
NIS.Identification_Distances_Engine_Off            5000.0  7000.0  10000.0
NIS.Identification_Probabilities_Engine_Off        1.0     0.88    0.66
NIS.Detection_Distances_Engine_On                  2000.0  4000.0  7000.0   10000.0  12000.0  15000.0
NIS.Detection_Probabilities_Engine_On              1.0     0.90    0.79     0.71     0.64     0.57
NIS.Identification_Distances_Engine_On             2000.0  4000.0  7000.0
NIS.Identification_Probabilities_Engine_On         1.0     0.84    0.71
NIS.Detection_Accuracy_in_Deg                      6.0
NIS.Update_Frequency_in_sec                        5.0
NIS.Life_Countdown_in_sec                          60.0
#
TRWR.Response_Time_in_sec                          1.0
TRWR.Alarm_Duration_in_sec                         3.0
TRWR.Azimuth_Coverage_Central_Angle_in_Deg         0.0
TRWR.Azimuth_Coverage_Delta_in_Deg                 120.0
TRWR.Elevation_Coverage_Central_Angle_in_Deg       37.5
TRWR.Elevation_Coverage_Delta_in_Deg               42.5
TRWR.Detection_Probability                         0.99
TRWR.Detection_Accuracy_in_Deg                     10.0
TRWR.Life_Countdown_in_sec                         30.0
#
MFD.Response_Time_in_sec                           0.5
MFD.Alarm_Duration_in_sec                          0.5
MFD.Azimuth_Coverage_Central_Angle_in_Deg          0.0
MFD.Azimuth_Coverage_Delta_in_Deg                  180.0
MFD.Elevation_Coverage_Central_Angle_in_Deg        15.0
MFD.Elevation_Coverage_Delta_in_Deg                25.0
MFD.Detection_Probability                          0.95
MFD.Detection_Accuracy_in_Deg                      2.0
MFD.Life_Countdown_in_sec                          30.0
#
NCS.Response_Time_in_sec                           0.5
NCS.Alarm_Duration_in_sec                          3.0
NCS.Azimuth_Coverage_Central_Angle_in_Deg          0.0
NCS.Azimuth_Coverage_Delta_in_Deg                  180.0
NCS.Elevation_Coverage_Central_Angle_in_Deg        0.0
NCS.Elevation_Coverage_Delta_in_Deg                90.0
NCS.Detection_Probability                          0.95
NCS.Detection_Accuracy_in_Deg                      0.0
NCS.Life_Countdown_in_hour                         8.0
#
# Countermeasures
#
ROS.Coverage_Angle_in_Deg                          15.0
ROS.Max_Turret_Rotation_Rate                       45.0
ROS.Launch_Distance_in_meter                       30.0
ROS.Response_Time_in_sec                           0.0
#
MCD.Response_Time_in_sec                           0.2
MCD.Jam_Time_in_sec                                3.0
MCD.Azimuth_Coverage_Central_Angle_in_Deg          0.0
MCD.Azimuth_Coverage_Delta_in_Deg                  11.0
MCD.Elevation_Coverage_Central_Angle_in_Deg        0.0
MCD.Elevation_Coverage_Delta_in_Deg                5.0
MCD.Max_Turret_Rate                                128.57
#
CPS.Response_Time_in_sec                           0.5
CPS.Jam_Time_in_sec                                3.0
CPS.Azimuth_Coverage_Central_Angle_in_Deg          0.0
CPS.Azimuth_Coverage_Delta_in_Deg                  60.0
CPS.Elevation_Coverage_Central_Angle_in_Deg        15.0
CPS.Elevation_Coverage_Delta_in_Deg                15.0
CPS.Max_Turret_Rate                                128.57
#
LCMD.Response_Time_in_sec                          0.5
LCMD.Jam_Time_in_sec                               3.0
LCMD.Decoy_Distance_in_meter                       20.0
LCMD.Max_Turret_Rate                               360.0
#
CMINE.Response_Time_in_sec                         0.5
CMINE.Jam_Time_in_sec                              3.0
#
NBCOP.Response_Time_in_sec                         30.0
NBCOP.Crew_Life_Countdown_in_sec                   60.0
NBCOP.Activation_Time_in_hour                      8.0
NBCOP.Decontamination_Probability                  0.95
```

```
#
ATRJ.Response_Time_in_sec                     0.5
ATRJ.Jam_Time_in_sec                          3.0
ATRJ.Azimuth_Coverage_Central_Angle_in_Deg    0.0
ATRJ.Azimuth_Coverage_Delta_in_Deg            180.0
ATRJ.Elevation_Coverage_Central_Angle_in_Deg  40.0
ATRJ.Elevation_Coverage_Delta_in_Deg          50.0
ATRJ.Max_Turret_Rate                          128.57
#
TCS.Coverage_Angle_in_Deg                     90.0
TCS.Inventory                                 2      2      2      2
#
Chaff.Response_Time_in_sec                    0.5
Chaff.Inventory                               30
Chaff.Duration_in_sec                         8.0
Chaff.Launch_Distance_in_meter                75.0
Chaff.Launch_Angle_in_Deg                     45.0
Chaff.Radius_in_meter                         21.0
Chaff.Max_Turret_Rate                         128.57
#
Flares.Response_Time_in_sec                   0.5
Flares.Inventory                              30
Flares.Duration_in_sec                        4.0
Flares.Launch_Distance_in_meter               150.0
Flares.Launch_Angle_in_Deg                    45.0
Flares.Radius_in_meter                        22.0
Flares.Max_Turret_Rate                        128.57
#
CFIRE.Max_Turret_Rate                         45.0
#
TSCAN.Max_Turret_Rate                         3.0
#
Data_Collection_PDU_Period_in_sec             30.0
#
# The following defines the grenade load for the turret sectors
# starting from the gun (top) and going clockwise in 15 degree increments.
# Label  tab  L8A1 tab M76 tab XM81 , top and clockwise
Sector_0        2    2    0
Sector_15       2    2    0
Sector_30       2    2    0
Sector_45       1    1    0
Sector_60       1    1    0
Sector_75       1    1    0
Sector_90       1    1    0
Sector_105      2    2    0
Sector_120      2    2    0
Sector_135      1    1    0
Sector_150      1    1    0
Sector_165      1    1    0
Sector_180      1    1    0
Sector_195      1    1    0
Sector_210      1    1    0
Sector_225      1    1    0
Sector_240      1    1    0
Sector_255      2    2    0
Sector_270      2    2    0
Sector_285      1    1    0
Sector_300      1    1    0
Sector_315      1    1    0
Sector_330      1    1    0
Sector_345      2    2    0
#
# The following is the CM Threat Mapping to be used by VIDS.
# Valid Order values: 0 - 8. The 0 order is the first CM to be used.
#
#threat class             priority   list of CMs in priority selection order
Class_1                   14         CPS    MCD    VIS    4      IR     4      Flares
Class_2                   13         CPS    MCD    VIS    4      IR     4      Flares
Class_3                   10         CPS    MCD    VIS    4      IR     4
Class_4                   6          CPS    LCMD   IR     4      VIS    4
Class_5                   8          CPS    IR     4      VIS    4
Class_6                   11         CPS    MCD    VIS    4      IR     4
Class_7                   7          CPS    IR     4      VIS    4
Class_8                   12         CPS    MCD    VIS    4      IR     4
Class_9                   9          CPS    MCD    IR     4      VIS    4
Class_10                  5          CPS    VIS    4      IR     4
Class_Mine                1          CMINE
Class_Chemical            2          NBCOP
Class_Muzzle              18         CPS    VIS    4      IR     4
Class_Muzzle_w_LRF        4          CPS    VIS    4      IR     4
Class_Muzzle_w_TCS        3          CPS    VIS    4      IR     4
```